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An American Engineer's Experiences in Russia

Form of the Present Bolshevik Government—Dismal Attempts to Harmonize Capital and Labor—A Word-Picture of Lenin

BY ROYAL R. KEELY

IT IS recognized by most thinking people that upon the settlement of the Russian question hangs the problem of peace in the world. There is much talk of crop failure, hungering, of concessions, trade treaties and business relations with the Bolsheviki. Therefore, the experience of one pioneer in the field may be of interest.

As a consultant in industrial economics, in America my chief interest and difficulty was in the labor problem. I wished to see how labor acted under Bolshevism, and what the prospect was of eventual trade relations with the United States of America.

My suggestion of a visit to Russia was welcomed with enthusiasm by Lomonossoff, special commissioner of the Soviet government in the United States. We sailed from New York on May 24, 1919, and after many difficulties and delays crossed the border into Russia on Sept. 12, of the same year. On the eighteenth we were welcomed by the chief officials in Moscow. For eight months I was given every opportunity to travel and to see and understand the industrial and economic situation.

As long as the Bolsheviki thought that there was a chance of my being permanently enlisted in their cause, everything that this poverty stricken country could provide was lavished upon me—secretaries, a special car on the railways, the finest hotel accommodations and food from the Kremil, the stronghold of the Bolsheviki. In May, 1920, all vises, permits and documents, signed, countersigned and red-stamped were received and I left Moscow, (May 7).

On May 12, at the border in Yambourg, I was seized, just five minutes before the train was ready to proceed across the border, taken back to Moscow under armed guard and thrown into their big Bouterki prison —the Sing Sing of Russia. There was no official warrant presented, no explanation, no charges, hearing, trial or sentence.

"Tried" and Sentenced

After suffering for a whole year all the insults and deprivations which they could inflict on a freedom-loving American, I was brought, with mock solemnity, into their highest tribunal and, after a two days' session, was sentenced to two years in a concentration camp, dating from the day of arrest. The only evidence brought against me in this "trial" was certain letters and memoranda written to my relatives in New York. By them the Bolsheviki saw that I knew too much. Therefore, in my "sentence" they said that I was a spy, that I had collected news of the economic and industrial situation for the American capitalistic press, that I had a contract with the *Chicago Daily News*, and that, therefore, I should be sentenced to two years in prison.

A few days later, after another solemn court setting, my sentence was changed to two years of compulsory work. That was on May 24 of this year, exactly two years after my departure from New York. Before my compulsory work began, there came the order for my freedom and a permit to leave Russia, due to the demands of the American Relief Association.

On Sept. 1 of this year I again received all permits to leave Russia, and at once went to Riga, where I was most warmly received by the U. S. Commissioner and the American Red Cross. All my personal needs were generously provided for, and I was made to feel that I was again a free man.

How Russia Attempted to Harmonize Capital and Labor

The great industries of America have been largely built up by the personality and driving force of a single man. The school for the management of the business has been the industry itself, progressing stage by stage. Those of the new generation, stepping into their father's shoes, have not had the developing school. Therefore, the biggest problem before the gigantic industrial enterprises is co-ordination, unification and scientific management. The human problem is the all-absorbing one. How can one bring about harmony between the factory owner and the working man—between capital and labor?

Russia has attempted to solve these problems in a new way—by the "nationalization" and "centralization" of the entire means of production and ways of communication and all business. The State has attempted to take over all private business and all industry. It has attempted to socialize and centralize all human activity. Therefore, the experiment must be of great interest, not only to industrial economists, engineers and factory executives, but to all Americans.

On entering Russia, one of the first things to attract my attention was the censorship. If this new workers' and peasants' republic was so good, why did those in charge not want to convert all the world by showing their results? Why should they struggle to prevent all news of their work and conditions from passing to the outside world, and with equal diligence guard against the entrance of all news from foreign countries? It has been their plan to receive in their own hands all foreign news as well as that of local and internal affairs. There is no free press and the Bolsheviki give out such matter as they choose through their two dailies, the *News* and *Truth*. Most of the leading papers from other nations are received in the foreign office, but they are not for the general public.

During my last three months news of the outer world came through an English speaking friend who had a special permit to read the various papers and to make digests of important news items for the head of one of the departments.

Lately the censorship is breaking down, but not through any change in policy of the Bolsheviki. The change is being brought about through foreign commissions which have uncensored mail privileges and through courier service. The entrance of the American Relief Association has opened the way for more freedom in communication with this country.

It is difficult for an American, accustomed to private initiative, private business and private homes, to understand this upheaval where all has been nationalized or requisitioned by the government. In Russia there are no public hotels and no living apartments for which one can bargain privately. All the houses are under the control of the central housing committee in Moscow. The factories also have been centralized and each has its own executive committee.

Present Form of Russian Government

Before the revolution, the large part of the population did not come in very close contact with the central government, except through the tax collector. The vast majority of the population of Russia lived in small villages that were largely self-governing through a direct voice in local meetings. This idea has been enlarged to embrace the entire nation. The form of organization is so worked out that each assemblage elects delegates to the next higher, until the highest authority in Moscow is reached.

The central Moscow government has some twenty departments, very much as in our own government. They include the war department, the state department, the military department, etc. One of the departments is called the "Supreme Council of National Economy." Its function is to operate, manage and control the entire means of production and ways of communication. Under its control are all factories, the railways, the telegraph and the telephone. As subdivisions of this council there are the Railways Department, the Metal Department (which embraces the majority of the metal-working factories), the Automobile Department (which has charge of building and repairing automobiles), etc. The Railway Department has charge of the repair of locomotives and cars.

In such a wholesale centralization, there are many details which have not been completely worked out, for example, whether the building of locomotives should come under the metal-working department or under the railway department. Also, if the locomotive building is to be under the metal-working department, then should not the locomotive repair come under the same department. This obviously offers difficulties as to whether the repair work should come under the production or the operating department. The same question has come up as to the automobile factories; are they under the automobile or the metal department? Another subdivision of the metal department is called "Gomza," which controls all machine tools for factories.

The centralized organization plan calls for executive control centering in Moscow. For example, the metal department is now under the direction of Martens, former Bolshevik agent in this country. In the matter of production management, each factory is supposed to have its production manager, supervised by production managers for the city, the government and the whole of Russia. The same applies for all other departments of manufacture, such as accounting, stores, design, development, tac.

An Interview With Lenin

When I arrived in Moscow, Lomonossoff took me to see one of the most talked-of men in the world—no less than Lenin himself. For entrance into Kremil and his private sanctum, we required special passes which were carefully scrutinized by some ten or fifteen armed guards at various stages of our path of entrance. Lenin spoke fairly good English and my translator sat by only to translate the occasional word which did not come to him readily. His outer office was filled with stenographers and clerks. His own office was a large, well-lighted room on the top floor of a six-story building. It was finely furnished, much like an American business man's office, except for the heavy red window curtains and many telephones.

Open upon his desk was a book against Bolshevism written by an Englishman. He laughed over the errors of this writer and explained to me how he had completely failed to comprehend or appreciate the ideals of this wonderful new "Workers' Republic." He impressed me as an impractical idealist, who was, to a large extent, shut off from the work-a-day world and the difficulties and privations of his people, and who had little experience or ability in directing the organization and reconstruction of such a great nation. He was surrounded by men, who, like himself, perhaps, may have been good revolutionists, but who had no executive ability for directing the enormous task which they had taken upon themselves.

Lenin repeated to me the invitation of Lomonossoff that I go into all the factories and see the actual conditions and the psychology of the working force. In return for this freedom, he asked me to give him reports on anything that I saw which was not in accordance with American practice.

As he suggested, I went into most of the factories in Moscow and the surrounding districts and talked personally with all classes of people, including the workmen and foremen of the various factories. In my next article, I shall describe my discoveries in this field.

Automotive Service Methods and Equipment

III. Tools Used in Re-machining Pierce-Arrow Transportation Units—Re-boring Fixtures —Valve Spring Tester—Welding and Re-milling Axle Shafts

BY HOWARD CAMPBELL
Western Editor, *American Machinist*

THE operations of servicing cars and trucks as exemplified by the Long Island service station of the Harrolds Motor Car Co., New York dealers for the Pierce-Arrow Co., are productive of some very interesting material.

All of the motors and other parts that go into the machine shop for repairs pass through the cleaning room first. This room is shown in Fig. 1, where an operator is seen lowering a crankcase into a wash tank. The use of an overhead trolley and an air hoist makes this work comparatively easy.

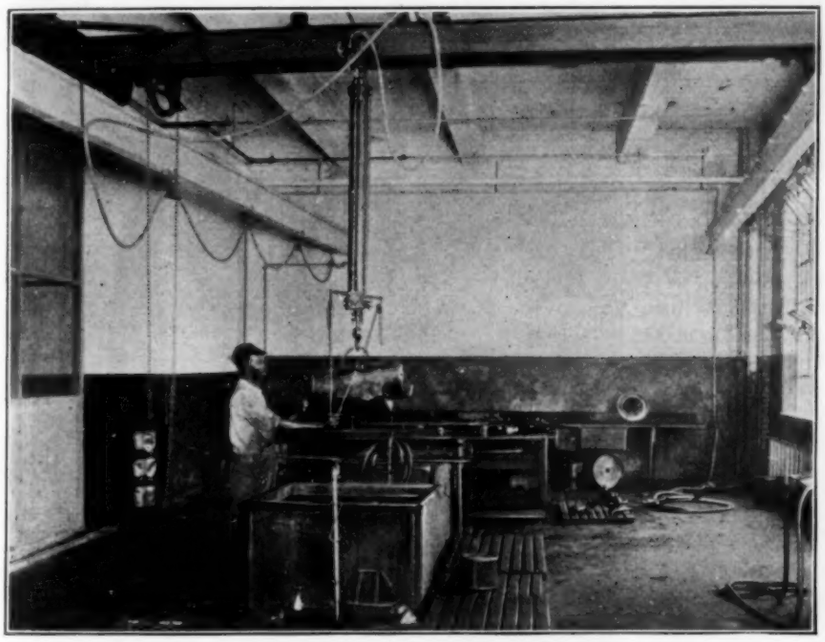


FIG. 1. CLEANING ROOM IN THE HARROLDS PLANT

At the present time there are four sizes of Pierce-Arrow connecting rods to be repaired. The lathe fixture shown in Fig. 2 is made to accommodate all four of these rods for re-boring. To one end of the fixture is attached a plate in which are four holes —one for each size of rod. To the other end is attached another plate in which are four pins which are numbered—as are the holes—from one to four. Each of these pins is turned so that it will fit the small end of one size of rod and is located so that when the plates are in position for boring a rod, as shown, the center distance between the holes will be correct. Each plate has four steel-bushed holes into which a locking pin fits, as shown at *A*. The clamp which holds the large end of the reamer in place is shown at *B*. Each of the four pins is threaded as at *C*, and a knurled nut *D* holds the small end of the rod firmly in position. The boring tool is a Davis boring bar with micrometer adjustment. When a set of rods is brought in for re-boring, the operator "mikes" each one of the crankshaft pins and bores the rods to the exact size of the pins on which they are to fit.

Another connecting rod tool is shown in Fig. 3. This is for facing off the ends of new bearings which either have been bored or are of the correct size so that they do not have to be bored. The rod is held in place by means of an expansion bushing which is tapered inside to fit the tapered end of a pin. This pin is made with the large end of the taper at the end of the pin and the taper on the inside of the bushing tapered the opposite way to correspond. The rod is placed in position, the pin is put through the bushing and both pin and bushing are put into the rod. The pin, which is threaded on the straight end to fit the locking handle *A*, extends down through the plate so that the handle can be tightened, thus expanding the bushing and locking the rod in place.

The upper plate *B* is hinged at the back so that it can be tipped up out of the way when putting in or removing a rod. The tool *C* is held in the shaft *D*, which is turned by the handle *E*. This shaft is a sliding fit in the part *F* which can also be turned by the handle *G*. The locking spring-pin *H* is attached to part *F*, and by locking this pin in one of the holes in the collar *J*, the shaft and the threaded shell turn together,

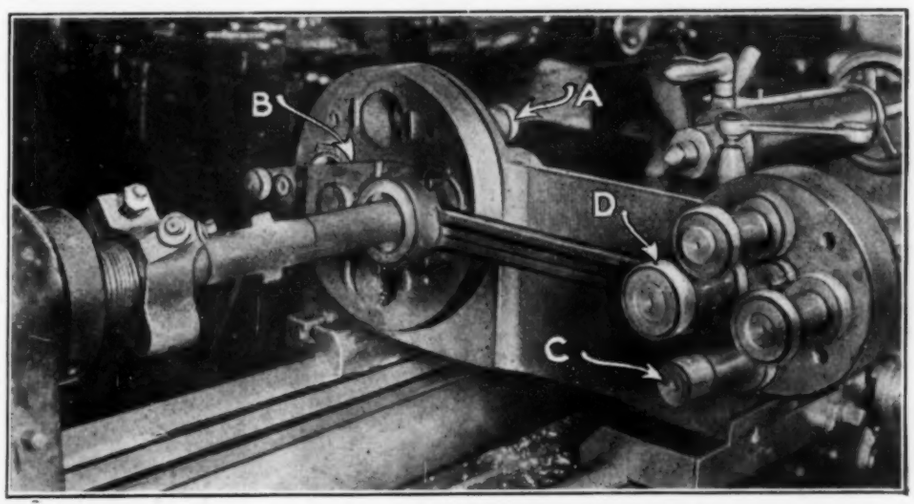


FIG. 2. FIXTURE FOR RE-BORING CONNECTING RODS

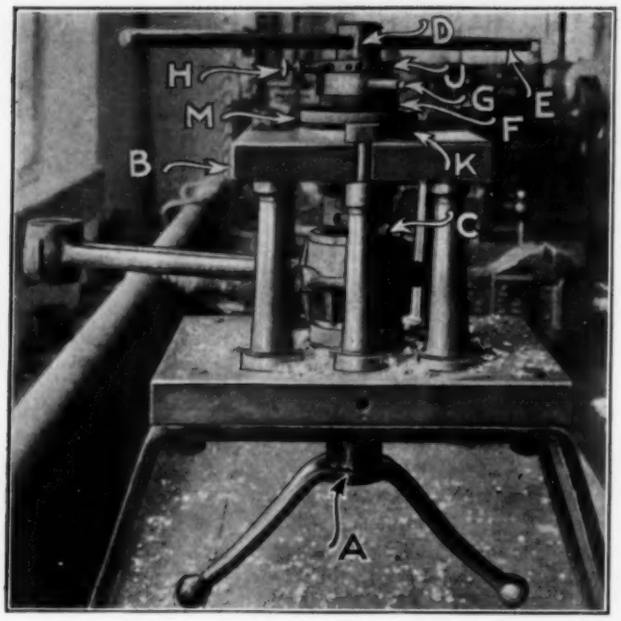


FIG. 3. TOOL FOR FACING OFF ENDS OF BEARINGS

thus feeding the tool to the work. Part *F* is threaded to fit a similar thread in a hardened steel bushing *K*. When the tool has been fed far enough, the locking pin is pulled out and the upper handle *E* is turned until the face of the bearing is even. A stop-collar *M* is provided so that a number of rods can be faced to the same dimension without measuring. The collar is set so that when it rides on the bushing *K*, the tool can go no further.

A Handy Gage

The tool shown in Fig. 4 is a gage for testing the grinding of valve heads. It is made in two parts, as shown. The interior of the large end of part *A* is ground to the taper required on the valves. The straight part of *A* is knurled on the outside so that it may be gripped firmly in the hand, and is bored through the inside for the bushing *B*. This bushing is one of several which are all made the same size on the outside, to fit the hole in part *A*, but have different size holes through them

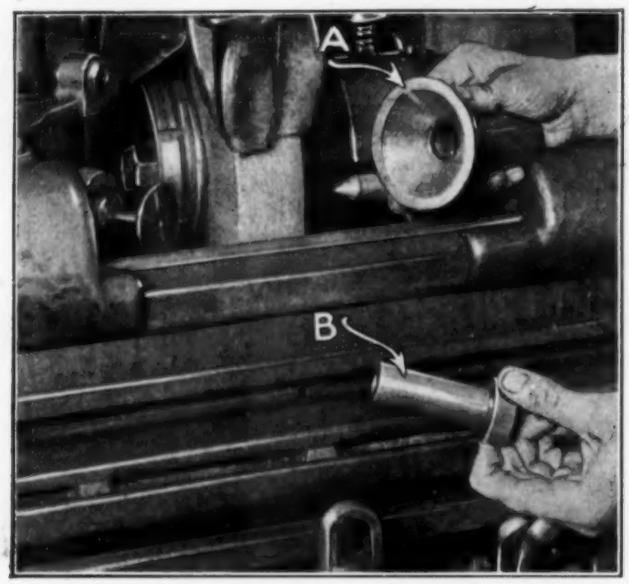


FIG. 4. GAGE FOR TESTING VALVE HEADS

to fit the different sizes of valve stems, thus making it possible to test the grinding of all valves with this gage.

When the angle on a valve head has been ground practically to a finish, a bit of Prussian blue is rubbed on the surface of the gage. Then the valve is inserted and turned around while the head rubs against the blue. In this manner the slightest variation in the angle can be detected, and all valves have to show a good full seat before being considered as finished.

Re-boring Main Bearings

An interesting arrangement for locating the proper center distances for re-boring main bearings in a horizontal boring mill is shown in Fig. 5. The crankcase is mounted on the fixture as shown, supported at either end by a piece similar to the part *A*, the two supports also aligning the case so that the main bearings will be parallel with the cylinder bores. Then a stub arbor carrying a crank gear *B* is put into the spindle of the machine and the table is adjusted so that the crank gear meshes with the two camshaft gears.

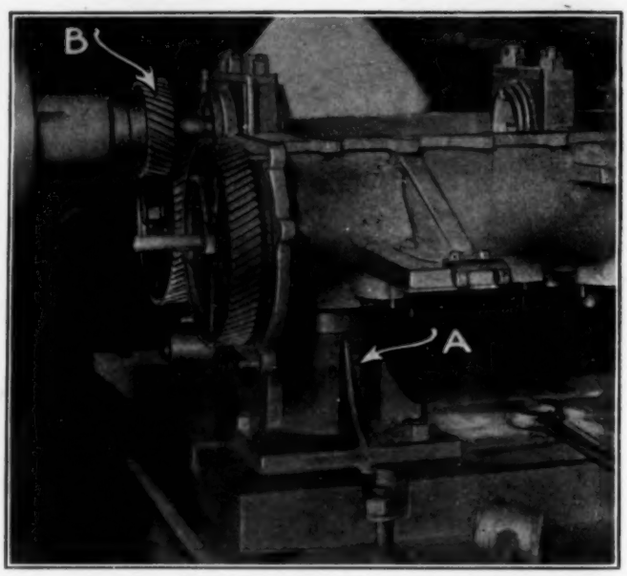


FIG. 5. FIXTURE FOR LOCATING CENTER DISTANCES

Then the table of the machine is adjusted both vertically and horizontally until just the right amount of back lash in the gears is obtained. When this result has been accomplished, the table is moved toward the tail end of the machine until the stub arbor can be taken out and the boring bar inserted in the spindle, after which the operation of boring the bearings proceeds.

A valve spring testing machine is shown in Fig. 6, where the operator will be seen in the act of testing a spring. The major parts of this tool are the scrap cylinder block and an ordinary scale. The scale is attached to the bar *A*, of which only part shows in the photograph. This bar is connected by the rod *B* to the lever *C* so that when the operator lifts the lever, he also raises the scale. To the scale is fastened the part *D*, which closely resembles a large C-clamp. At the lower end of this piece is a seat into which a valve spring fits. The upper end of the spring will, when the spring is raised, seat against the piece *E*. To test the strength of a spring, the operator places the spring in position and then raises the lever, which also raises the scale, the C-clamp and the spring. The

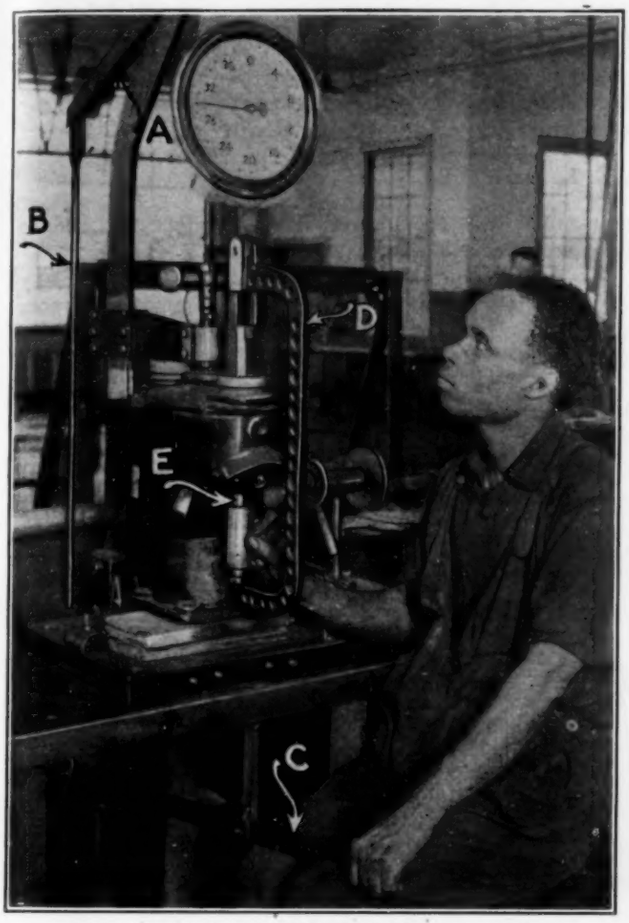


FIG. 6. VALVE SPRING TESTING MACHINE

result is that the spring is caught between the two seats and as the lever is raised further, the spring is compressed until the gage will just fit between the two spring seats. Obviously, if the spring is weak, very little pull will be necessary, while if the spring is strong, its strength will be reflected on the dial.

FIG. 7. REPAIRING AN AXLE SHAFT BY WELDING

A great deal of money and material is saved at this plant in the reclaiming of axle-shafts which would otherwise be scrapped. The operator shown in Fig. 7 is welding metal into the splines of an axle-shaft which had become so badly worn that it was useless. The welding is done with the aid of an electric current which is transformed through a Wilson plastic arc generator from 220 v., 16.8 amp., to 37.5 v., 150 amp. One pole of the generator is connected to the large iron ring on the table, and the other one is connected to the electrode which the operator is holding in his hand. Held in this electrode is a piece of $\frac{5}{16}$-in. steel wire through which the current travels to the point of contact. When the operator touches the end of the wire to the steel shaft, an arc is formed and the wire melts off, filling the splines with solid metal.

The next operation is the re-milling of these splines as shown in Fig. 8. This is a simple milling operation requiring, so far as special tools are concerned, a center and a dividing head with a chuck.

Electrification of Italian Railways

Reports forwarded by assistant commercial attaché Osborne, of Rome, indicate that the director general of the State Railways is suggesting that the govern-

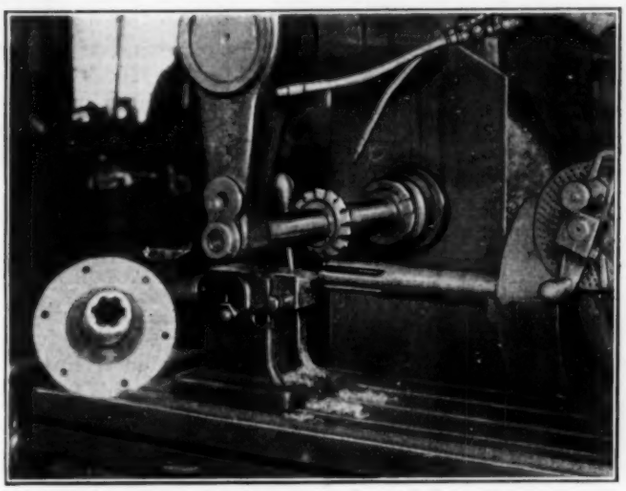


FIG. 8. RE-MILLING OPERATION ON SHAFTS

ment have the reparations account settled in part by requiring the Germans to hand over material which could be used in electrifying government railways. The office of the auditor general is said to oppose this means of settlement and to consider it preferable to have the adjustment of reparations made on a strictly money basis.

The reports state that plans have been completed for the electrification of the Bologna-Verona-Brenner, Pisa-Leghorn, and Venezia Giulia lines, as well as for a shortened route between Rome and Naples.

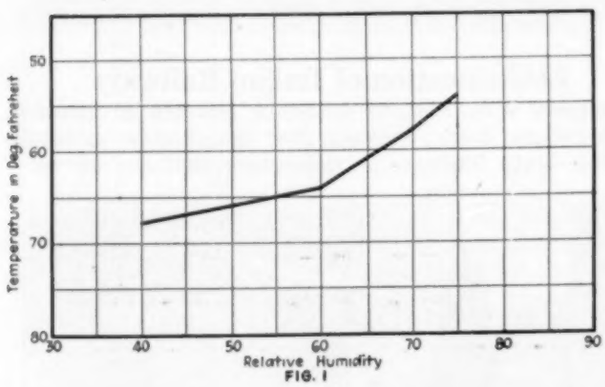
In order to carry out this extensive program the Director of Railways is negotiating with the Ministry of the Treasury in order to obtain the necessary funds. According to information just received from commercial attaché H. C. MacLean, of Rome, the *Official Gazette* of Oct. 1 published law decree No. 1298 whereby the State Railways Administration is authorized to expend the sum of 160,000,000 lires (about $6,400,000 at present exchange) for the purpose of 120 electric locomotives.

Industrial Ventilation

The Relation of Ventilation to Efficiency—Various Methods of Natural and Artificial Ventilation—Humidity and Temperature Govern Comfort

By R. L. GOULD and E. L. HEWITT

INDUSTRIAL ventilation is fast becoming the accepted rather than the unusual practice and it has undoubtedly come to stay in the modern industrial world, because our health, happiness and efficiency depend largely upon the degree of purity of the air we breathe. The reduction of lost time due to poor health and the increase of productivity to a maximum by providing proper conditions, are factors included in practically all of the larger schemes of production today. The human body is more or less a miniature furnace.



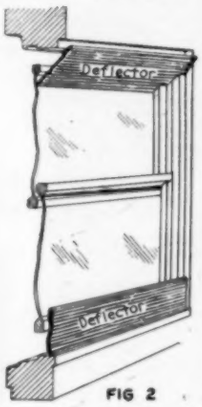


FIG. 1. THE CURVE OF COMFORT SHOWING TEMPERATURE IN DEGREES FAHRENHEIT AND RELATIVE HUMIDITY. FIG. 2. TYPICAL WINDOW DEFLECTOR MAY BE MADE OF BOARD, GLASS OR SHEET METAL, ACCORDING TO THEIR APPLICATION

The food which we eat supplies the fuel for this furnace and the resultant heat must be dissipated from the body in some way after satisfying bodily needs. The effectiveness of any general system of ventilation is determined by its proficiency in removing the excess heat from the body.

The transfer of heat by radiation, evaporation and conduction applies to the human body as well as to material. To afford the proper degree of comfort the air in an office or workroom must have such a quality as to aid heat loss from the body by one of these three methods. There are three factors which have a direct effect upon the rapidity with which the body will give off its excess heat: (1) Relative humidity; (2) temperature; (3) air circulation.

Air at a definite temperature will hold a certain amount of water vapor or moisture. When the point of saturation is reached, the moisture comes out in the form of dew or rain. At this point of saturation, the relative humidity is considered to be 100 per cent. In other words, the air has suspended in it all the water vapor it can hold at that temperature.

In as much as the relative humidity gives the moisture content in the air, it has a very direct influence upon the heat loss from the body by evaporation. The less degree of moisture in the air, the more rapid is the evaporation and the consequent cooling effect on the body. The effect of high relative humidity is manifest especially during the summer months, and that same effect less pronounced has a tendency to reduce the productiveness of the worker.

The relative humidity taken alone does not have any very definite meaning. The degree of comfort of a room depends upon the combination of the temperature and relative humidity together with the air circulation. There has been plotted a "Curve of Comfort," Fig. 1, showing the proper relation between temperature and relative humidity. Reference to this will show that for a temperature of 54 deg. F. the relative humidity may run as high as 75 per cent, and the room still be comfortable. At a temperature of 68 deg. F. a relative humidity of more than 40 per cent will be found to decrease the comfort of the individuals in the room.

Consensus of opinion has determined that 70 deg. F. is the maximum temperature allowable for any room. The New York State Commission on Ventilation advocates the following standard temperatures where employees are doing work that requires strenuous physical exertion: 60 to 64 deg. F., and where the work is comparatively light, 66 to 68 deg. F.

The circulation of air is a factor which has an important bearing upon the comfort of the workers. In a room where there is little or no circulation, a blanket of dead air surrounds the body. To this blanket of air the body gives off its heat and impurities by means of radiation, evaporation, and conduction. If this air blanket is not disturbed, the air surrounding the body rises in temperature and the body becomes uncomfortable. When this air blanket is periodically removed by new air, its temperature is not permitted to rise to an uncomfortable degree and the loss of the heat from the body goes on at its normal rate. It is essential therefore, that there be proper air circulation to insure the replenishing of this blanket. The manner of providing adequate circulation may be one of many types; indeed the methods of ventilation and their application are so diversified as to warrant special consideration later.

The type of room, the operation performed in it, and the workmen employed therein, all have a direct bearing on the space allowed per employee. Some mechanical or chemical processes require more air space than that necessary in a room where some light operation is being performed. A male adult requires more air space than a female. Both of these should have a greater allowance than that provided for a minor. The strenuousness of the work performed is a factor to be considered because the more physical exertion demanded by the operation, the larger the allotment of air space should be.

There is somewhat of a variation in the requirements of the different states for the cubic feet of space allowed for each individual worker. The allowance

of 250 cu.ft. per person should be the absolute minimum and this should be the exception rather than the rule. Illinois requires 500 cu.ft. of air space per employee and this undoubtedly more nearly approaches a proper limiting figure.

A change of air three times an hour is hardly perceptible to the workers and provides for an adequate supply of fresh air under normal conditions.

Methods of Natural Ventilation

The principal methods of obtaining the proper amount of air, without any attempt to condition it, by natural means are: (1) Window ventilation; (2) doors and transoms; (3) elevator shaft, stairwells and courts; (4) roof ventilators.

Window Ventilation

Window ventilation is undoubtedly the most frequently used in industry today. One of the principles of good ventilation is to avoid drafts. If not controlled properly, ventilation by means of windows is apt to provide for the greatest infringement of this rule. To forestall the possibility of a strong draft reaching a worker, window deflectors are of great value. The variations of the principles involved are many, but practically all types serve to deflect the air upward and allow for the proper circulation without direct draft on the workers. Fig. 2 shows a typical deflector. In many cases the arrangement of the window shades prevents the proper air circulation. Shades should be so arranged at the middle of the windows that they will pull both up and down. This arrangement does not interfere in any way with the proper entrance and exit of air at the top and bottom of the windows.

Window ventilation is limited as to its application, although it is in use in a large proportion of the older plants at the present time. In a comparatively wide building the effect of window ventilation is apt to be

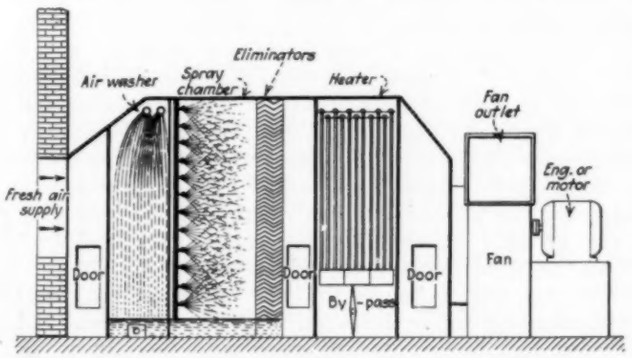


FIG. 3. PLENUM SYSTEM OF VENTILATION SHOWING AIR CONDITIONING EQUIPMENT

entirely nullified by the time it reaches the center of the room. Then too, a draft which will cause a proper amount of circulation in the center of such a room would be very undesirable to those workers near the windows.

In summer, when the room temperature is approximately that of the outside air, there is very little natural circulation taking place. In winter, cold air coming into the room is objectionable to the workers. This difficulty may be remedied somewhat by the installation of radiators under the windows, but the human factor involved where the windows are opened and closed by employees is apt to determine the success or failure of such a system.

In general, the window system of ventilation is adaptable to rooms where the windows have been properly equipped with deflectors and have the proper arrangement of shades. It is not apt to be a success in a comparatively wide building. Window ventilation should be confined to work rooms which have a fairly large allotment of air space per employee and where there is no special dust or fume hazard.

Doors and Transoms

While ventilation by means of doors and transoms forms but a minor part of the problem of ventilation as a whole, it cannot be ignored, especially in small rooms or offices. An open transom often affords a means of circulation and the opening and closing of a door creates a circulation which, although slight, tends to make the room more comfortable. An open door may greatly benefit the circulation of air in a room.

Elevator Shafts, Stairwells and Courts

Ventilation obtained by means of open elevator wells often plays an important part in the ventilation of a room. This is especially true if the shaft opens to the outside at the bottom and into the rooms at the various floors. The normal movement of an elevator will cause more or less circulation in the adjoining rooms.

It is borne in mind however that the benefits derived in the way of ventilation should be a secondary consideration to the fire hazards involved in this type of ventilation. Elevator shafts should always be equipped with automatic fire doors, but these need not interfere with the circulation of air obtained from the shaft. Practically the same ideas apply to the use of stairwells and courts as to elevator shafts for natural ventilating purposes.

Roof Ventilators

The principle that warm or hot air rises is the basis for the use of roof ventilators. There are a number of such ventilators on the market at the present time and the essential principle in their construction is to allow warm air from the room below to escape and at the same time to keep out rain, snow, sleet and strong drafts. With this system of ventilation, the fresh air supply as a rule comes from the windows in the lower portions of the room.

Methods of Mechanical Ventilation

Experience has shown that for many types of buildings and processes, natural ventilation is inadequate. The development by mechanical means of ventilating offices and work rooms has progressed until today we have a mass of information available on the subject. While various manufacturers of ventilating equipment vary the design of their product, the principles involved in ventilating by mechanical means fall under one of the following systems: (1) Fans for circulation only; (2) vacuum or exhaust system; (3) plenum system; (4) combined methods.

Fans for Circulation

Fans perform the function of circulating the air and this circulation materially affects the comfort of the worker by providing for the removal of the surrounding "blanket of air" referred to previously. The present day practice advocates the use of individual fans for circulation for office work only; as the following system affords a more effective and cheaper means of ventilating workrooms. For office use however, fans have a

very definite field and will often help to alleviate the uncomfortable condition brought on by warm weather.

Vacuum or Exhaust System

For workers or employees in a workroom of more or less crowded conditions, where there exists a dust or fume hazard, where excessive heat or humidity is given off by the operation performed, ventilation by mechanical means is the only solution to the adequate handling of the problem.

The so-called "Vacuum System" of ventilation derives its name from the suction action it has in drawing air from a room. It makes no provision for the supplying of fresh air to the room, but depends upon the atmospheric pressure to equalize the partial vacuum formed.

The application of the exhaust system to localized machinery forms the field for the greatest usefulness of this type of ventilation, and will be considered later.

For general room ventilating purposes the direct exhaust system has some application. This consists of placing exhaust fans in the walls or windows of the building. These fans form a suction on the room and exhaust the impure and warm air to the outside atmosphere.

The exhaust method of ventilation assures a change of air to the workers, although the source of the incoming air should be determined, so that impure or hot air will not be drawn into the room. The low cost of installation and the reasonable maintenance cost are the outstanding advantages of this type of ventilating equipment.

Plenum System

The forcing of air into a room by means of force draft fans is known as the Plenum system of ventilation. This type of ventilating permits the air to be properly conditioned before it enters the workroom. This factor often warrants the installation of this system especially in many industries where the character of the products manufactured requires the maintenance of air conditions of a certain quality.

For the ordinary purposes of industry a simple system of this kind readily adapts itself. Heating coils placed in the main duct will remove the chill from incoming air in the winter time. Conversely, if a refrigerating plant is installed in the building, the air may be cooled in the summer before it is admitted to the workroom.

In larger systems of the plenum type the air is often cleaned, humidified and warmed. Reference to the sketch, Fig. 3, will show the principles involved in conditioning air by use of these various methods.

Air may be cleaned by either filtering or washing. Washing the air is the more satisfactory method, although if the cloth through which the air is filtered is changed at regular intervals the filtration method has a very definite application for smaller installations.

Washing the incoming air, in general, is passing the air through a water screen. This water screen is formed by sprays issuing downward from the top of the spray chamber. This spray carries with it to the bottom of the chamber most of the dust and dirt in the air and leaves it "freshened." The water is drawn off from the bottom of the spray chamber and may be used again after being filtered. Air washing allows the air which has been used in the plant to be re-circulated after washing, thus saving the expense of heating the incoming air to the proper temperature.

After passing through the washer the air passes over the eliminator plates which remove the excess water.

Passing through the water screen increases the humidity of the air. Thus, when the air comes to the heating coils any desired humidity may be obtained by controlling the heat supply to the air. This is true, because the higher the temperature the greater capacity air has for holding water vapor and the control of the temperature automatically controls the maximum amount of water vapor which can be suspended in the air at that temperature.

Temperature of the air leaving the system can be controlled to remain within practically any range. This type of installation readily lends itself to automatic control as the heaters may be by-passed by a thermostatically controlled mechanism when the temperature becomes too high, or too low.

In the summer time the heating coils may be replaced by refrigerating coils. As this involves the installation of a refrigerating plant, it is seldom warranted except in large auditoriums or hospitals. A frequent practice however is to run water direct from the factory supply through the coils. This somewhat reduces the temperature of the incoming air and is a much less expensive operation.

Combined Methods

The most satisfactory ventilating installation is a combination of the vacuum and plenum systems.

The removal of the impure and warm air by means of a vacuum or exhaust system connected with a plenum system supplying air under proper conditions is the ideal arrangement.

No definite rule can be set for the installation of a specific type of equipment as each individual case has its peculiarities which need special consideration.

Exhaust Systems for Localized Installations

Occupational disease is largely due to the dust or fume hazard prevalent in our industries today. It is not within the scope of this paper to discuss the effect of fumes or dust upon the workers. Let is suffice to say that in general they affect the membranes of the throat, nose and lungs. Metal dust, by its action on the membranes of the lung, renders the worker susceptible to tuberculosis. Lead, arsenic and mercury are apt to cause chronic poisoning. Dust, feathers, and hair may carry germs. Fumes from benzol, aniline and lead affect the blood, heart, eyes and nerves.

The best way to handle the dust and fume hazard is to eliminate it. The installation of wet processes and inclosed machinery has done away with this hazard in some plants.

If it is necessary to perform an operation where dust or fumes result the workman should be equipped with respirators, helmets, and other protective devices and the operation carried on in a dust-tight room or compartment. Where these methods are not practicable, the local system of exhaust ventilation has a wide application.

Position and Type of Hood

Where localized exhaust systems of ventilation are to be used, the position and type of hood are two very important elements. The hoods should in every case be as close as possible to the source of dust or fumes. If dust is to be removed and is light enough to float in the air, the hood should be over the top of the machine. If the dust is heavy enough so that it settles quickly,

the hood should be arranged so that the dust will fall into it by the action of gravity upon it. The same type of hood used for removing heavy gases has been found satisfactory for removing the lighter type of dust. In these cases the pipe leading to the exhaust fan is attached to the side of the hopper, so that the fan will not have to handle the heavy particles of dust which would naturally settle in the bottom of the hopper, and may be removed from time to time. It is sometimes necessary, because of the construction of the machine, to place the hood at the side of the machine with a resultant lateral motion to the dust or gas.

Chips or dust particles coming off from grinding wheels are often moving at a rapid rate. This action should be utilized to aid the exhaust to handle the material, and may allow a reduced suction on the system.

Where it is impossible to entirely inclose the process the material should be discharged away from the operator.

Construction of Hood

Hoods, when made of galvanized sheet metal, prove generally satisfactory. The gauge of the metal is dependent upon the size of the hood, and the amount of stiffness which is required for that particular process.

In the case of grinding wheels, the hood should serve a two-fold purpose. It should be properly constructed to exhaust the dust, and at the same time, be strong enough to serve as a protection to the operator in case the wheel breaks.

In some cases acid fumes are given off, and the action of these fumes upon galvanized sheet metal is very detrimental unless they are lined with some noncorrosive substance. It is possible in certain cases to make satisfactory hoods of wood, provided they are of the proper design.

Some processes lend themselves readily to the installation of one large hood for several machines. However, the individual type of exhaust hood is more satisfactory for general ventilating work.

The ventilation of workrooms and factories of industrial plants is practically in its infancy today. The effect of improper ventilation upon the health of the workmen and their resultant decreased production is a subject which is at the present time being investigated by several prominent authorities. When the results of these experiments are published a direct connection should be shown between ventilation, production and profits.

The authors wish to acknowledge reference and valuable information from the following authors: "Safe Practices," pamphlets 32 and 37, issued by the National Safety Council which were drafted by W. D. Keefer, safety engineer, National Safety Council. "Heating and Ventilation," by Harding and Willard. "The Modern Factory," By George M. Price.

Engineering Work in Ceylon

Early in October the Ceylon government floated a loan in London which, with earlier installments, totals £6,000,000. The proceeds of this loan are to be used for the construction of the Colombo drainage works, the extension of the Colombo waterworks, the Batticaloa-Maho and Trincomalee Light Railway, and the duplication of the main line and other railway and public works in the colony.

The above is a very substantial sum and indicates that there will be a great deal of activity in general engineering construction lines in Ceylon in the near future.

Nested Steel Compression Springs

By T. F. STACY

It is frequently desirable to design springs which are to be nested one within another for use in places where the length of the spring is limited, or where the diameter of wire for a single spring is large in comparison to the diameter of the coil. This article deals with the design of such concentric springs so proportioned that all springs are worked to the maximum fiber stress. The amount of compression for the nest is proportional to the load imposed on the springs, as in the case of a single spring.

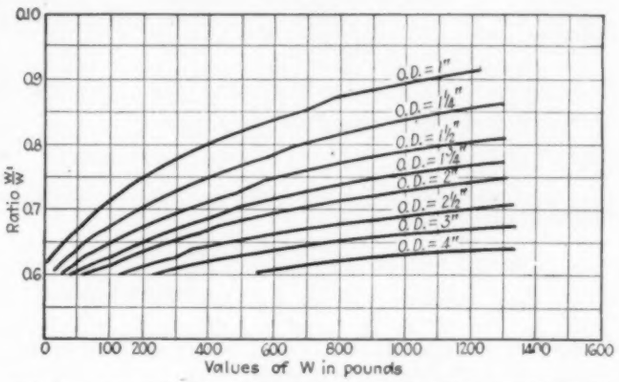


FIG. 1. CHART FOR DETERMINING W FOR A 2-SPRING NEST

On page 581, Vol. 53, of the *American Machinist*, the writer published an article on the design of individual springs; and the curves therein illustrated may be used to advantage in connection with the solution of the problem of this article. In lieu of these curves the various tables published in handbooks may be used to design the separate springs of the nest when the necessary data are obtained as given in the following paragraphs:

The known quantities in the problem are the total maximum load which is to be supported, the maximum outside diameter of the outside spring or nest, and the total amount of deflection. To design a nest of springs, it is necessary to find the load carried by each spring in the nest and the outside diameter of each spring.

The conditions which must be imposed are that the free length, solid height, and total deflection shall be the same for all springs of the nest. The allowable maximum fiber stress shall vary according to the size of wire and as recommended by our leading spring manufacturers. The clearance between springs shall be enough to allow free play. In this article a clearance of $\frac{1}{8}$ in. on the diameter has been allowed.

The following notation is used in the formulas:

D = Mean diameter of spring from center to center of wire.
d = Diameter of wire.
F = Total deflection of spring.
f = Allowable deflection per coil.
W = Total maximum load which the spring can support.
OD = Outside diameter of spring.
n = Number of turns in the spring.

When subscripts are added to these characters the subscript 1 shall refer to the outside spring of a nest, the subscript 2 shall refer to the next spring, etc. Where the characters are used without subscripts, they

shall refer to a single spring which may be used to replace the nest.

Since the solid height and free lengths of the springs in a nest must be equal, we have

$$n_1 d_1 = n_2 d_2 = n_3 d_3, \text{ etc.} \quad (1)$$

$$n_1(f_1 + d_1) = n_2(f_2 + d_2) = n_3(f_3 + d_3), \text{ etc.} \quad (2)$$

The usual formulas of spring design give

$$f = \frac{8WD^3}{d^4G} \quad (3)$$

$$\text{and } W = \frac{d^3\pi S}{8D} \quad (4)$$

Whence, from (1), (2), (3) and (4),

$$\frac{D_1}{d_1} = \frac{D_2}{d_2} = \frac{D_3}{d_3}, \text{ etc.} \quad (5)$$

For a nest of two springs, we have

$$W = W_1 + W_2 \quad (6)$$

and

$$D_1 = D_2 + d_1 + d_2 + \tfrac{1}{8} \quad (7)$$

Whence, from (5,) (6,) and (7,)

$$\frac{W}{W_1} = 1 + \left[1 - \frac{2d_1 + \frac{1}{8}}{OD_1}\right]^3 \quad (8)$$

For a nest of three springs, we have

$$W = W_1 + W_2 + W_3 \quad (9)$$

$$D_1 = D_2 + d_1 + d_2 + \tfrac{1}{8} \quad (10)$$

$$D_2 = D_3 + d_2 + d_3 + \tfrac{1}{8} \quad (11)$$

Whence, from (9), (10), (11)

$$\frac{W}{W_1} = 1 + \left[1 - \frac{2d_1 + \frac{1}{8}}{OD_1}\right]^3 + \left[\frac{(OD_1 - 2d_1)^3 - \frac{OD_1 - d_1}{4}}{(OD_1)^3}\right]^3 \quad (12)$$

Various values of d_1 and OD_1 were assumed and the corresponding values of W_1 were found from the curves

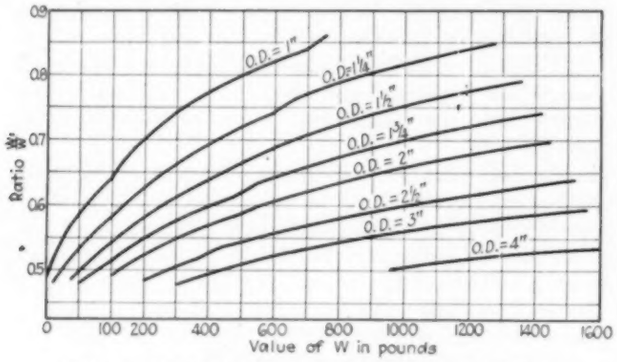


FIG. 2. CHART FOR DETERMINING W FOR A 3-SPRING NEST

previously mentioned. Values of W were then found in formulas (8) and (12) by substituting the values of d, OD, and W, as mentioned above. The curves shown in Figs. 1 and 2 were then plotted, giving W and OD, which will be the known quantities in a problem on nested springs, and the ratio of $\frac{W_1}{W}$. The values of W_1 may then be determined and the outside spring of the nest designed, since for this spring W_1 and OD_1 are known.

One set of curves is for a nest of two springs and one for a nest of three springs. If there are two springs in the nest $W_2 = W - W_1$ and $OD_2 = OD_1 - 2d_1 - \frac{1}{8}$, and the inside spring may be designed since W_2 and OD_2 are known.

If there are three springs in the nest $W_2 + W_3 = W - W_1$ and $OD_2 = OD_1 - 2d_1 - \frac{1}{8}$. The two inside springs may then be designed from the curves for nests of two springs as described above.

In figuring values of W_2 or W_3, subtract from W the the values of W_1 or W_1 and W_2, which were obtained from the proportions given by the curves, and not the actual values used to conform to standard sizes of wire. If this is not done the free length of the last spring will not check with the others.

An exact solution is not possible, because standard sizes of wire must be chosen. The nest should, therefore, be checked for total maximum supporting strength, equal free length and solid height of all springs, and for sufficient clearance between springs. Adjacent springs should be wound opposite hand.

The total load should be taken about 10 per cent in excess of the desired strength of the nest, to allow for variations in the stiffness of the wire.

The breaks in the curves are due to the different fiber stresses assumed for different sizes of wire. For No. 25 to No. 13 W. & M. gage wire, 120,000 lb. per square inch was used; from No. 12 to No. 4 wire, 100,000 lb. per square inch; and from No. 3 to $\frac{7}{16}$-in. wire, 90,000 lb. per square inch. This is in accordance with modern practice.

Solution of a Problem

The following example will illustrate the use of the curves:

Design a nest of three springs having an outside diameter of 4 in., to support a load of 1,600 lb. with a deflection of 4 in.

From Fig. 2, for nests of three springs we find that $\frac{W_1}{W} = 0.535$. Therefore, W equals $0.535 \times 1{,}600 =$ 856 lb. The outside spring will have an outside diameter of 4 in. and support 856 lb. under a deflection of 4 in., these data being obtained from the article previously referred to. A spring having 5.6 coils of $\frac{7}{16}$-in. diameter wire and a free length of 6.4 in. will fulfill these requirements.

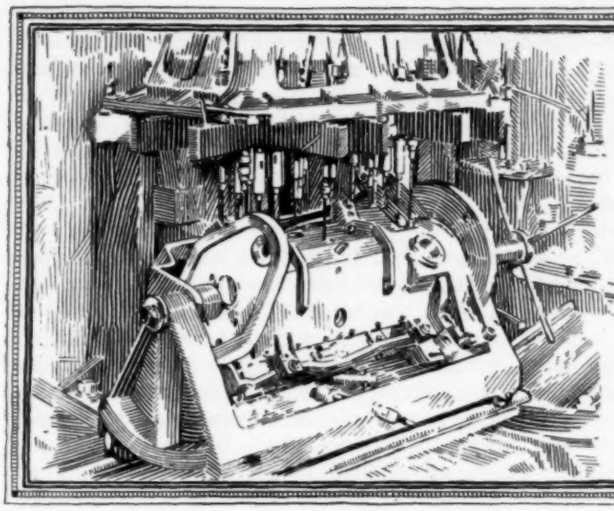
The two inside springs must support 1,600 — 856 = 744 lb. The outside diameter of the second spring is $4 - \frac{7}{16} - \frac{1}{8} = 3$ in. From the curve for nests of two springs, Fig. 1, we find that the outer spring of the two carries 0.65 of the load carried by the two springs. Then,

$$W_2 = 0.65 \times 744 = 484 \text{ lb.}$$

A spring having an OD of 3 in. and supporting 484 lb. will be made of $\frac{11}{32}$-in. wire and will support 540 lb. Then 7.8 coils are needed, giving a free length of 6.6 in.

The inside spring must support 1,600 — 856 — 484 = 260 lb. and will have an OD of $3 - \frac{11}{16} - \frac{1}{8} = 2\frac{3}{16}$ in. Now, 10.7 coils of No. 3 wire will support 265 lb. and such a spring will have a free length of 6.6 in. The total load which the nest can support is 856 + 540 + 265 = 1,650 lb.

A cut and try method without using the curves is as follows: It can be shown that $\frac{W_1}{D_1^3} = \frac{W_2}{D_2^3} = \frac{W_3}{D_3^3}$, etc. $W_1 + W_2 + W_3 + \ldots$ is also known from the conditions of the problem. Various values of D may be assumed and corresponding values of W computed from the given equations. D and W will then have been found for each spring and they may be designed. They must then be checked for equal solid heights and free lengths, total load, and sufficient clearance between the springs.



Tool Engineering

By
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Work-Holding Fixtures for Turret and Engine Lathes Continued—Second-Operation Tooling on Special Work—Sliding Index, Angular, Counterbalanced, and Other Fixtures

IN FIG. 252 is shown a piece of work *A* which has been previously faced at *B* and which is to be machined at *C*, *D* and *E*. The hole *E* is slightly eccentric to the portion *C*, as indicated in the diagram. The fixture body *F* may be mounted on an adapter or screwed to the spindle, as desired. The member *G* is

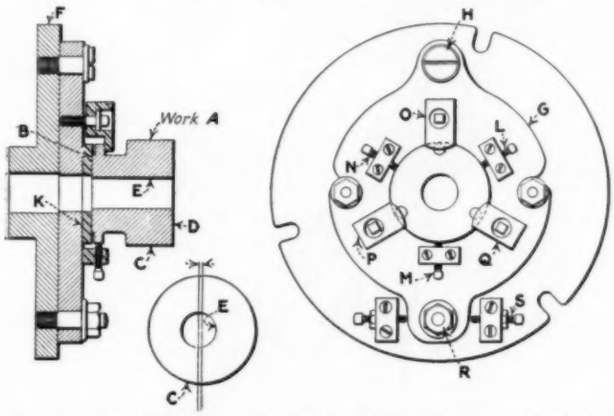

FIG. 252. ECCENTRIC FIXTURE WITH SWIVEL MEMBER

mounted on *F* so that it swings on the shouldered screw *H*. The work is located on the hardened plate *K* mounted on a swiveling member, and its position is determined by means of the three screws, *L*, *M* and *N*. These screws are mounted in steel blocks suitably located. The work is held down by the three clamps at *O*, *P* and *Q*, these clamps being operated by a socket wrench. After the hole has been machined, the nut *R* is loosened and the swivel is moved over until it strikes the stop screw at *S*. This distance can be accurately determined by using a size block.

A point of importance in connection with a fixture of this sort is the location of the stop screws in relation to the center and to the pivot screw *H*. It is advisable to make the distance the same on each side of the center, so that the eccentricity obtained will be exactly half of the movement between the stop screws. The simplicity of fixtures of this sort for work which has only a small amount of eccentricity makes them very desirable, as their construction is such that they can be made up cheaply. A sliding fixture can be designed which will give the same results, but its cost is somewhat more, due to the necessity for fitting the slide.

In making up a fixture for a piece of work which requires two holes to be put in at some distance from each other, a sliding fixture can be used. A diagram to illustrate this kind of a condition is shown in Fig. 253. The work in this case is a casting *A* having two holes of different sizes 3 in. apart and parallel to each other. The illustration is simply intended to represent the problem in diagramatic form, in order to show the conditions which are found. The faceplate is made up in such a way that a slide of the dovetail variety is mounted on it at *B*. The work is clamped by some convenient method to the slide, and locations for the two holes are obtained either by means of plugs entering bushings or by stop screws suitably arranged. If work is very much heavier on one end than on the other, it may be necessary to arrange some kind of a counterpoise to keep the fixture in proper balance, but unless high speed is to be used this might be found unnecessary. Sliding fixtures of various kinds can be made, according to the nature of the work and the amount of eccentricity required. In locating any piece of work from a tapered hole care must be taken to make the tapered member so that it will float. If this is not done slight variations between the taper and the other finished surfaces may result in an improper location and cause inaccurate work. The flywheel shown at *A* in Fig. 254 is an example of this kind. The work has been previously finished in the tapered hole *B* and also at *C* and *D*. The fixture *E* is designed to be screwed directly to the spindle, but it can also be mounted on an adapter if desired.

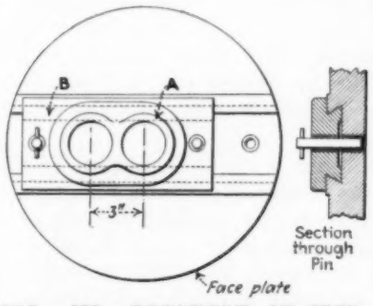

FIG. 253. PRINCIPLE OF SLIDING-INDEX FIXTURE

The work locates on the taper plug *F*, which is so arranged that a coil spring keeps it in contact with

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the hole during the chucking operation. It is restrained so that it does not travel too far, by means of a screw *G*, which enters a slot on the outside of the plug. Thefinished rim on the flywheel locates on a hardened ring *H*, against which it is clamped by means of hook bolts *K*. These hook bolts are operated from the back of the fixture by means of nuts at *L*. The nature of

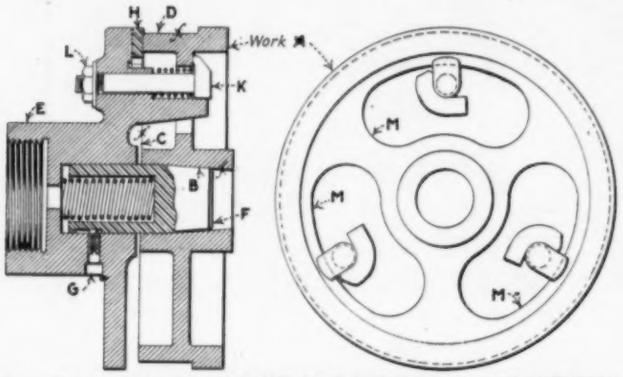

FIG. 254. SECOND-OPERATION FIXTURE FOR FLYWHEEL

the casting gives an excellent opportunity to apply this method of clamping, as the hook bolts extend up through the cored holes in the casting *M*, leaving room enough so that when the bolts are turned around the casting can be removed readily.

In clamping the work down by means of the hook bolts, the taper plug remains firmly in contact with the hole and adjusts itself when the clamps are tightened. If there is any variation between the taper and the finished surface *C*, it will be taken care of if this method is used. A screw taper plug can also be used in place of the spring plug, but this is not as good practice, as it depends upon the operator's "sense of touch" and he is likely to force the plug into the taper too far or too little and thus cause inaccurate work.

Fixture for an Angular Fitting

In Fig. 255 is shown the principles of a fixture designed for holding a piece of angular work *A* while machining the portions *B*, *C* and *D* in a definite relation to a previously finished portion *E*. This example is given to illustrate a principle rather than to show the complete design of a fixture. The work locates in a bushing *F* in the body of the fixture *G*. The fixture is mounted on an adapter by means of the finished ring at *H*.

The method of clamping the work is by means of a sliding jaw *K* operated by a special screw *L*, using a socket wrench. This jaw comes up against the end of the casting at *M*. If the casting is rough it might require a swivel jaw at this point too; but if it has been finished a plain jaw will answer the requirements. The jaw is fitted to a slide, as shown in the end view at *O* and *P*. For the majority of work it would be possible to cut this slide directly in the casting. A better construction is to make two strap clamps at *Q* and *R*, fitting these to the slides where necessary. Angular work of this kind is encountered from time to time, and the designer should study methods which can be applied to suit peculiar conditions.

Counterbalanced Fixture

An example of a fixture having a counterbalance is shown in Fig. 256. The work *A* is to be machined in this operation on the end *B*. The spindle end, which is at an angle to the part to be machined on the counterbalanced fixture, has been machined in a previous operation, so that it is necessary to provide a means of locating the piece from it. The fixture *E* is so designed that it can be attached to a faceplate, locating in the hole by means of a flanged portion *F*. Provision is made so that T-bolts can be used in the slotted portions of the fixture to hold it back against the faceplate.

The work locates in a hardened bushing at *C* and on a ring at *H*. It is drawn down on the surface of the ring by means of a nut at *D*. The finished surface of *M* is at an angle of 1½ deg. with the center of the fixture; and as made here *M* is cast as a unit with the remainder of the fixture. It might be more economically made and easier to machine if it were made in bracket form and screwed and doweled on to the body of the fixture. The work is held in its correct location by means of a setscrew at *K*, the action of which tends to throw it over against stop *L*, which is made adjustable in order to allow for making changes that may be required by variations in the castings. The counterbalance *G* is also made as a part of the fixture, and it

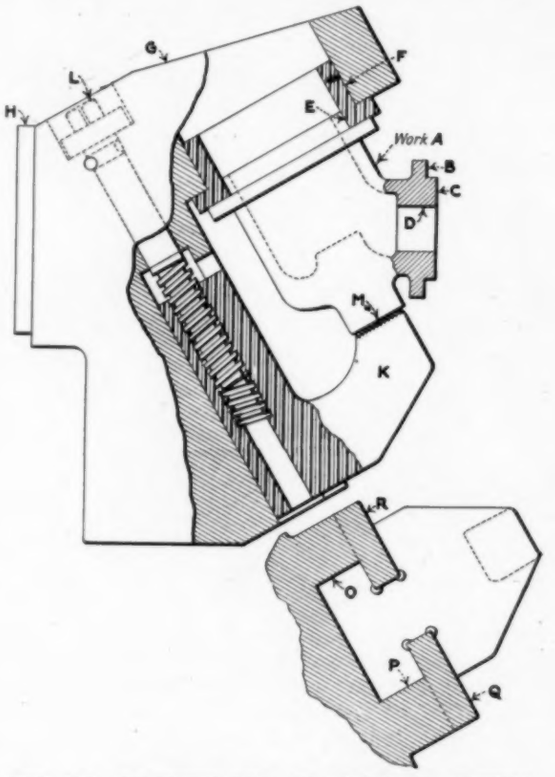

FIG. 255. FIXTURE FOR AN ANGULAR FITTING

would naturally be drilled out or faced off so that it will balance the opposite side with the work in position. It might be possible to design this part also as a separate unit, and fasten it to the body of the fixture by means of bolts.

Another method which can be used to hold work of this kind would be to make the counterbalance *G* and the bracket *M* in such shape that they can be fastened to a standard faceplate, in which case no fixture would be required other than the parts mentioned. This practice would not be considered very good unless the faceplate were kept as a unit with the fixture, because of the possibility of errors arising from resetting the parts on the fixture.

Another special fixture which can be attached to a faceplate is shown in Fig. 257. The work *A* is a swivel bracket which has been machined in a previous operation at *B*, *C* and *D*. It is required to machine the surfaces *F* and *E* in a certain relation to the other portion, and in order to do this the fixture shown was designed. The body of the fixture *H* is provided with three holes, so that it can be fastened to a standard faceplate. The plug *G* is set in an angular bracket so that the work locates on it, and is held down against the hardened ring by means of the nut and C-washer *K*. The location of the large end is obtained by swinging the flange against the hardened pin *L* and holding it there by means of the screw at *M*. This fixture allows the tools to operate in turning the portion *E* and *F* without interference. The work is held rigidly and its location is fixed so that the proper relation is obtained between the various surfaces.

Pot Fixture for a Stamping

An unusual fixture is shown in Fig. 258, in which the work *A* is a steel stamping, 12 in. in diameter. The outside of this stamping *B* is held closely to size and the work which is to be done is the turning of the portion *F*, facing of *E*, boring of *D* and back facing of *C*. It was desired to do this in one operation and the fixture was designed for this purpose, special tools being used for the back-facing operation. The fixture *H* is screwed to the spindle of the machine and a ring *K* is fastened to it. The inside of this ring is provided with two other hardened rings *L* and *M* which are ground to such a size as to allow the work to fit into them freely. The work is placed in the fixture until it rests against three locating studs *M*, which determine the end location. For driving the work, a thin spring-steel ring *O* is fastened at *P* and passes entirely around the drum, against which it is drawn up snugly by means of a nut at *Q*. This band has a contact against nearly the entire surface of the drum and gives sufficient driving power to withstand the pressure of the cut.

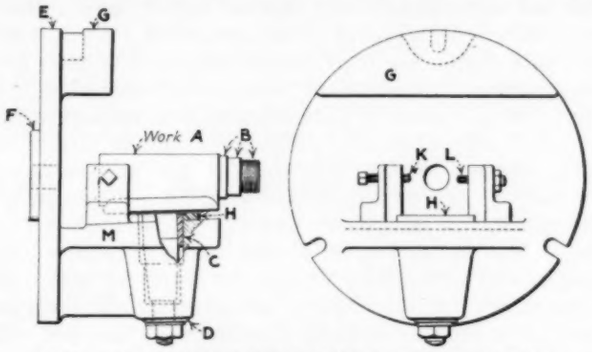

FIG. 256. COUNTERBALANCED FIXTURE FOR STEERING KNUCKLE

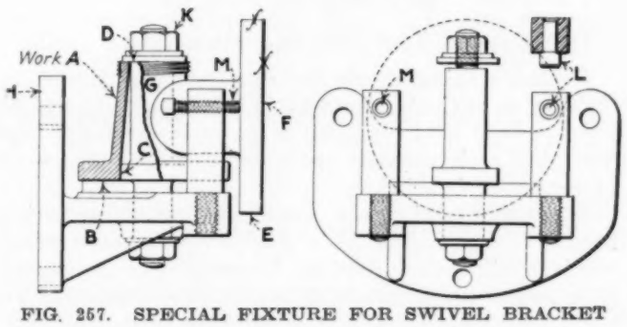

FIG. 257. SPECIAL FIXTURE FOR SWIVEL BRACKET

Work which has been previously machined sometimes requires another operation on it of drilling or hollow milling. When this portion must be held carefully in relation to the previously machined part, provision should be made to guide the drill or hollow mill. An example of this sort is shown in Fig. 259, in which the work *A* has been machined in a previous operation, as shown by the finish marks on the large end. The fixture *B* is designed to fit into an adapter fastened to the spindle. The work locates in a hardened ring *C* in the body of the fixture. It is held in place by means of the two hook bolts, *D* and *E*, the arrangement of which is such that they can be operated very rapidly. Swivel C-washers *F* are used under the heads of each of the bolts *G*, being attached to the hook bolts as shown. One side of the fixture is carried up at *H* to form a bracket in which the guide bushing *K* is located. This guide bushing serves to locate a combination hollow mill and facing tool which is used to machine the stem *L* and the surface *M*, these two portions being required to be concentric with the other end which has been previously finished. In removing the work from the fixture, the bolts *G* are unscrewed slightly and the C-washers thrown back, which allows the hook bolts to spring out until restrained by the collars on the bolts. An ejector is provided at *N* to knock the piece out of the locating ring. One side of the fixture is open at *O* so that the operator can easily reach in and remove the work.

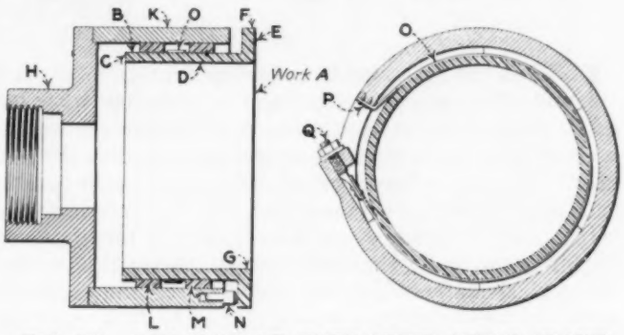

FIG. 258. POT FIXTURE WITH STEEL STRAP CLAMP

In making up fixtures which carry guide bushings for any sort of cutting tools, care must be taken both to provide plenty of room for chips and to give ample hand clearance so that the work can be easily removed and placed. The support for the bushing must be sufficiently rigid to withstand any pressure developed by the cutting action. In cases where cutting lubricant is to be used, provision should be made for it either by carrying the liquid through the tool or by having openings through the fixtures so that the fluid can easily reach the work.

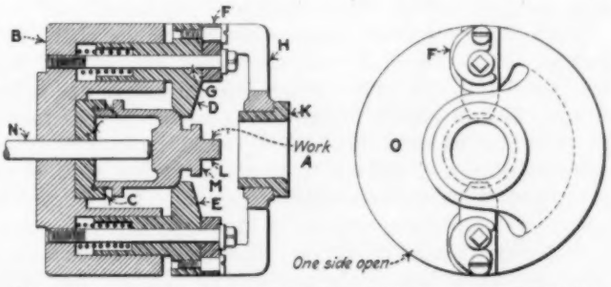

FIG. 259. SPECIAL FIXTURE WITH GUIDE BUSHING

Necessity of Better Application of Economic Principles

Crest of Business Wave a Poor Time to Build Stock—Wages Must Come Down With Other Costs—Stabilization Will Come From Knowledge

By ERNEST F. DuBRUL
General Manager, National Machine Tool Builders' Association

JUST as the necessity of better application of physics and other sciences has been manifested with the growth of industries, so we need better application of economics to improve the fundamental health of business. As long as business men blind their own eyes to fundamental laws and then insist on doing the wrong thing, they cannot realize how much better it would be for them to do the right thing. Some things that can and should be done at one stage of the economic cycle are absolutely the wrong things to do at another. For instance, when a wave is reaching its crest is the wrong time to make stock. The costs are then always the highest, because of many reasons. Yet many business men, as soon as the wave begins to recede, keep on producing as though the wave were to continue at a high level. They put up stock at a high cost, and then liquidate it on the down grade, taking a loss. If they had used their information properly, they would never have incurred such loss. If they had shut off their production, cleaned up their stocks, and kept good financial reserves to begin again when the next wave starts, they would be strong. At the bottom, or just as a buying wave begins to get under way is the best time to increase stocks, because that is when costs are lowest.

Paying the Penalty for Poor Judgment

Many manufacturers in this last wave made that same mistake and are now paying the penalty. They thought that it was a good thing to keep workmen employed and maintain their organization. Many workmen had become extravagant in their own personal expenditures. They were not saving money; they were not even working full time; but on the contrary were indulging in "conspicuous leisure," to show that they did not have to work. Continuing production for stock under these circumstances only gave such workmen additional means to be wasted for a time, and just when they did not need them. Stock production deprived the manufacturer of liquid resources and made it just that much less possible for the manufacturer to finance production when costs were lower, jobs scarcer, and when men needed jobs more than they did at the top of the wave.

Union labor leaders are sadly mixed in their economics when they tell men that they cannot and will not stand a cut in wages when general prices are going down. This situation makes it impossible for the manufacturer to continue production when he might otherwise be able and willing to produce, if his costs could step down with the recession of buying. It is very difficult to get men to accept a cut in wages when a factory is running full. The factory has to shut down before the men know the cut is necessary. Society has often suffered from production lost that could otherwise have been made on the receding side of the wave, because workmen do not want to take a cut in wages while the factory is running. Unless the manufacturer does cut, he produces at high costs and must later take losses that do no one any good. Meanwhile the workmen have perhaps wasted a great deal of what the manufacturer himself later takes as a loss on writing down his inventories.

Union labor leaders do not recognize the futility of their demands to maintain an artificially high level of wages. If railroad labor is overpaid, it means that other labor must be underpaid to overpay the railroaders. Through political control the railroaders may for a while get that overpayment, but it cannot last. Eventually all prices seek their relative level, whether those prices are for commodities or services. Prices based on inflated values during a war boom, whether for railroad labor or anything else are sure to be eventually deflated by the working of economic law. They might get high wages per hour or per day for the little time they work, but their total wage is not enough to buy their living. Some of them then will be willing to take jobs at lower prices, and these men begin to bid for the jobs, instead of the job bidding for the workman. Finally the law of supply and demand works out, and in spite of all the efforts and the fulminations of the union leaders somebody in the industry offers lower wages, and gets plenty of men to work for him. His competitors find him doing business at less costs and making a profit. Finding that they too can get some laborers—even at the cost of a union boycott or strike or what not—they go out and hire at the market price, and they start production at lower costs.

The Danger Line for the High Price Level

The same thing affects the retail storekeeper, manufacturer or anybody else, who in the face of a receding wave tries to hold his price at an uneconomically high level. All such attempts are bound to fail—they cannot be continued indefinitely.

Experience and study show that wherever prices have been maintained at a dead level for any considerable length of time, that level—contrary to the general impression—could not have been uneconomically high. On the contrary that level could have been, and probably was uneconomically low.

A price chart is published every year giving the prices of iron and steel products. On that chart are nine curves of prices of various products. One is immediately struck by the fact that one line goes across that chart from 1901 to 1915 without a break. That line shows the price of steel rails. All other products varied more or less in price, but the steel rail price continued steadily straight across. Now anyone with two grains of sense knows that this price was artificial; it could not have been stabilized otherwise. Other lines show a certain stability for short periods of time on this chart, but these periods of stability in the other products are very short.

Now what made it possible for the steel rail price to be maintained so long? There were only two condi-

tions under which it could exist. Costs of production from 1901 to 1915 certainly would not be constant in steel rails any more than in any other product. Left to the free operation of economic law, the price of steel rails would have varied with the costs, if with nothing else.

The first enabling condition was that there were very few producers in the field. If there had been more competitors the price could not humanly have been stabilized for such a great length of time, any more than the prices on bars, beams and tank plates which give evidence of stabilization for various short spaces during this period. The more producers the less chance of artificial control of price.

Where Stockholders Lost Profits

The second condition was that the $28 price on rails was uneconomically low rather than uneconomically high. Competition between a few strong producers might conceivably have brought about a condition of absolutely uniform costs at a given time, but not even such competition could keep costs uniform one year with another. Certainly direct costs went higher in the boom of 1906 and declined in the dull year 1908. What actually happened was, that economically sound, conjunctural profits were sacrificed in the periods of active business during that long period of 15 years, to the detriment of the stockholders of the rail mills.

If the steel companies had really known their true costs they could just as well have had those profits. Just because they maintained the rail price, it does not follow, however, that the price maintained was economic—all economic experience is against such a conclusion. If uneconomic, it was either uneconomically high or uneconomically low. If it had been an excessively high price, more capital would have been attracted to the rail business in spite of the largeness of the amount necessary. The only reason it kept out was the fact that on the whole the price was uneconomically low. The artificial maintenance of price could only succeed in holding prices down when they should have gone up, and so profits legitimately and economically possible were sacrificed.

Prosperity Dependent Upon Knowledge of True Costs

If the few rail manufacturers had really been individually well informed enough to regulate their own prices properly, the price would never have gone below economic cost at any time, and at some other times it would have afforded them much more profit than they got out of the business. Of course, they thought they were doing the right thing—but in view of universal experience in every other economic field, any student of fundamentals must conclude that the actual facts could not justify the belief. Believing a thing to be true does not make it true. Acting on a false belief in business causes many a loss, and prevents many a legitimate gain.

Whenever the full facts become known it is seen that while it is easy to send prices down, and to hold them down to an uneconomically low level, it is hard to put them up, and it is practically impossible to hold them up to an uneconomically high level. Is there any reason to think that steel rails afford the one possible exception to an otherwise universal rule?

The sooner business men recognize both these facts the healthier business will be and the better off will society be. The more business concerns there are in any line, who are really getting their true costs, the less there will be who will offer their goods below cost. One of the best uses of a cost system is to show up inefficiency and to make for lower costs, and thereby lower prices. Another is to tell just how low prices can be made without sacrifice of legitimate profit.

A real cost system coupled with full knowledge of demand will tell a man when to shut down and wait for the next buying wave, and will tell him if his business demands that procedure. Prices must in the long run repay the cost of necessary idleness. Every man has some pegging point for his prices, but many business failures are caused by continuously making prices too low, and thereby sacrificing capital. Men do it because they don't know their true costs. If they did, their pegging points would be higher. If they knew what was the real demand, and how it swings up and down, they would count the irreducible cost of necessary idleness, and figure it into their lowest possible price.

The Danger of Uneconomic Competition

Eventually the sharp peaks and dips in prices can be minimized, but not by agreements—only by absolute economic knowledge. As it is now, uneconomic, ill-informed competition is responsible for wide fluctuations. If all business men in every line had good cost systems and a thorough knowledge of the operations of economic laws they would individually adjust their business to the real situation and by better individual adjustment their industry would adjust itself as a whole.

Society would benefit by stabilization of business, but stabilization can be brought about only by better understanding of fundamental principles. It can only come by knowledge deeply imbedded in the soul of the individual.

Rewards for Suggestions

By John Mark May

The article by C. J. Morrison on page 448 of the *American Machinist* under the heading "Rewards for Suggestions," should and I think will, strike a responsive chord in many quarters.

Whatever commodity we may have to dispose of, whether it be material, labor, entertainment or advice, is generally offered in a market where a fair return may be expected. I have enough confidence in my fellow man to believe that usually the inclination is not to make a sale that will place the buyer in a losing position, but on the other hand that the sale of the commodity is made because the buyer is in a position to make good use of that particular commodity and therefore can offer a fair price for it. In other words, the buyer is in a position to put his purchase to work and thereby secure a revenue greater than could have been procured by the man who sold it, and by the transaction both parties have made a sane and logical business arrangement.

Their interest has been, and is likely to remain, mutual and not only both parties but the public as well have the use of something that otherwise might have been kept hidden only to rust or mold.

There can be no greater asset for a corporation or an individual than a reputation for square dealing, as Mr. Morrison has so well shown in the examples given.

Power Requirements of Machine Tools

An opportunity to check up the power requirements of the various machines in operation in the Southwestern Shipbuilding Company plant at East San Pedro, Cal., and to make such changes as would increase the effectiveness of the electrical installations was afforded when the company settled down to the construction of ships upon a peace basis.

To obtain the necessary information for a study of the existing conditions upon which improvements might be based, a power survey was made of all the 220 motors installed in the plant. The greater number of these motors were installed during the construction period and therefore it was possible to obtain experimental and operating data as to the peculiar requirements of the work to be performed in this particular plant. As operations progressed and observations of power con-

POWER REQUIRED TO DRIVE VARIOUS MACHINES IN SHIPBUILDING PLANT

No.	Machine	Motor Hp. Make	Poles, R.P.M.	Drive	Duty	Character of Load	Volts	Amp. Max.	Amp. Run	Kw.	Power Factor, Per Cent	Load, Per Cent
1	Crane	30 U.S.	8 ..	Gear	Hoist	Raise ½ ton	440	94	77	16.25	28	72
						Lower, light	440	..	81	13.0	21	58
4	Crane	30 G.E.	8 ..	Gear	Hoist	Raise 4½ ton	422	96	62	28.7	65	128
						Raise ½ ton	426	96	46	17.5	52	78
8	Crane	22 U.S.	6	Gear	Travel	100 ft. per min	420	29	21	4.25	27	26
11	Crane	25 W	6	Gear	Travel	150 ft. per min	424	38	24	8	45	42
17	Crane	22 U.S.	6 ..	Gear	Boom	Raise 3 ton	418	58	23	10.5	63	64
						Lower ½ ton	418	..	17	1.25	10	8
22	Crane	22 U.S.	6	Gear	Swing	Average of right and left swing	426	38	33	4.25	18	26
26	Crane	20 W	6 ..	Gear	Swing	Full speed right	424	38	21	6	39	30
						Full speed left	422	30	19	5	36	22
29	Blower	20 G.E.	4 1,475	..... Direct	....	..... Furnace air	426 ...	95 ..	13	8.00	83 ..	54 ..
30	Gate shear	10 G.E.	8 865	Belt	....	Idle	446	40	7.5	1.75	30	23
						Shear ¾-in. channel	446	..	14.0	9.5	88	127
						Flywheel	446	..	15.75	11.25	92	150
31	Angle shear	10 G.E.	6 1,165	Gear	....	Idle	450	41	6.0	1.87	40	25
						Cut-off 3½-in. x 3½-in. x ½-in. angle iron	450	..	11.5	7.50	84	100
						Cut-off 6-in. x 6-in. x ½-in. angle iron	456	..	15.0	10.0	85	134
32	Angle bender	10 G.E.	6 1,020	Gear	....	Idle	450	40	6.5	0.75	15	10
						Bending 3-in. x 3-in. x ½-in. angle	450	..	7.3	1.87	63	25
33	Plate punch	7.5 G.E.	6 1,012	Gear	....	Idle	450	60	6.0	0.625	13	11
						¾-in. hole in ½-in. plate	446	..	7.7	3.75	63	67
34	Vertical punch	7.5 G.E.	6 1,150	Gear	....	Idle	448	61	6.0	0.625	13	11
						¾-in. hole in ½-in. plate	448	..	9.0	4.37	62	78
						¾-in. hole in 1-in. plate	444	..	24.0	17.0	92	300
35	Horizontal	7.5 G.E.	6 1,020	Gear	....	Idle	446	60	5.25	0.60	15	11
						¾-in. hole in ½-in. plate	445	..	10.75	6.2	75	110
36	Horizontal	7.5 G.E.	6 1,200	Gear	....	Idle	446	65	5.75	0.62	14	11
						¾-in. hole in ½-in. iron	448	..	11.5	6.87	76	123
37	Punch and shear	7.5 W.	6 950	Gear	....	Idle	450	66	5.25	0.625	15	11
						¾-in. hole in ½-in. iron	450	..	7.75	4.0	71	71
						Trimming liner	452	..	8.50	5.50	84	98
44	Two-wheel grinder	3 G.E.	4 1,720	Direct	....	Idle	446	16.5	2.4	0.225	12	10
						Ave. grinding	450	..	2.5	0.550	28	25
45	Two-wheel buffer	3 G.E.	4 1,720	Direct	....	Idle	450	13.5	1.95	0.175	12	8
						Buffing, ave. pres	448	..	1.95	0.425	28	19
46	Trip-hammer	2 G.E.	6 1,130	Belt	....	Idle	448	12.5	1.90	0.25	17	17
						Hammering, full speed	440	..	2.5	1.00	52	67
48	Compressor 17-in. x 14-in. and 10-in. x 14-in.	150 G.E.	10 595	Belt	....	95-lb. pressure	428	544	154	99.2	87	88
						28-lb. pressure	...	..	95	52.0	73	46
55	Compressor, 22-in. x 16-in. and 13-in. x 16-in.	200 G.E.	12 485	Belt	....	97-lb. pressure	456	784	265	184	88	124
						25-lb. pressure	458	..	165	104	79	70
58	24-in. circ. ripsaw	20 G.E.	4 1,520	Belt	....	Idle	418	93	9	2.45	38	17
						3½-in. O. P. plank	418	..	20	12.5	86	84
60	36-in. cutoff saw	10 G.E.	8 760	Belt	....	Idle	433	42	5	2.0	49	27
						Cutting 4-in. x 12-in. O.P. plank	430	..	12.5	8.25	88	111
63	42-in. band saw, 1½-in. blade	5 G.E.	4 1,485	Belt	....	Idle	420	48	3.75	2.0	73	53
						Slow feed rip 12-in. wood block	420	..	8.0	5.0	86	133
64	Two 10-in. wheel grinders	2 G.E.	4 1,480	Direct	....	Idle	426	13.5	0.9	0.125	19	08
						Average pressure (wood)	426	..	1.1	0.45	55	30
73	8-ft. reversing planer	7.5 G.E.	6 1,015	Belt	....	Idle	454	37	8.5	1.87	28	33
						At instant of reversals	454	..	15.0	5.25	45	94
							452	..	13.0	4.50	44	80
74	Turret lathe	7.5 G.E.	6 1,005	Belt	....	Heaviest load	448	34	7.0	3.75	70	67
						Idle	454	..	5.5	1.25	29	22
						Cutting-off	454	..	6.25	3.00	62	54
85	Power saw drill, grinder	7.5 G.E.	8 865	Belt Line shaft	....	Idle, line shaft	446	36	5.5	0.55	13	10
						Approx. max. load	440	..	6.3	2.5	52	48
86	Two 20-in. drills, 15-in. lathe, power saw	7.5 G.E.	8 770	Belt	....	Idle	456	38.5	5.9	0.87	19	16
						Lathe and drills	456	..	6.2	1.50	31	27
						All machines	456	..	6.5	2.10	41	37
88	Drill grinder, 8-in. wheel	1 G.E.	4 1,530	Belt	....	Idle	446	4.4	1.3	0.36	35	48
						Heavy grinding	446	..	1.5	0.57	50	77
90	Grinder	5 U.S.	4 1,532	Direct	....	Idle	450	31	3.8	0.42	14	11
						Medium grinding	450	..	4.6	2.00	56	54
						Heavy grinding	450	..	5.6	3.00	69	80
91	Two 8-in. wheel grinders	2 G.E.	4 1,550	Direct	....	Idle	452	8	1.7	0.17	12	11
						Heavy grinding	452	..	2.8	1.75	81	117
						Heavy both wheels	452	..	3.4	2.25	85	150
94	Sensitive drill	1 G.E.	4 1,548	Belt	....	Idle	444	3.8	1.6	0.22	18	30
						Running idle	444	..	1.6	0.41	32	55
						Drill ⅞-in. hole	444	..	1.6	0.45	35	60
95	Pipe threader	7.5 G.E.	6 1,000	Belt	....	2-in. pipe	450	0.37	6.00	0.70	15	12
						Same end of cut	454	..	6.25	0.87	18	16
						3-in. pipe	454	..	7.5	1.62	28	29
97	Power saw threader, 20-in. drill	7.5 G.E.	8 770	Line Shaft	....	Line shaft	444	39	6.0	0.62	13	11
						All machines running	444	..	7.0	1.50	28	27
						Threading 7-in. pipe	444	..	7.25	2.25	41	20
99	Two 8-in. wheel grinders	2 G.E.	4 1,700	Direct	....	Idle	450	18	3.2	0.21	09	14
						Heavy grinding	452	..	3.3	0.50	19	34
130	Bolt threader	5 G.E.	6 1,015	Belt	....	Idle	452	27	4.3	0.67	20	18
						Run over ¾-in. thread	452	..	4.3	0.82	24	22
						Thread ¾-in. bolt	452	..	4.5	1.20	34	32
131	Nut-tapper	7.5 G.E.	6 1,010	Gear	....	Idle	456	35	5.8	0.90	20	16
						Tap 4 sizes nuts at once	456	..	6.1	0.95	20	17
132	Two 12-in. wheel grinders	5 U.S.	6 1,032	Direct	....	Idle	448	30	5.7	0.55	12	15
						Heavy grinding	454	..	5.9	1.00	22	27

sumed were taken, the plant was found to be operating upon a very low power factor. From this it was evident that overloaded and underloaded motors were in use and that unbalanced conditions of load existed. An improvement of power factor would mean a decrease in the cost of power service and an improvement in rating and loading conditions would decrease the cost of maintenance.

Therefore tests were made on the several feeder circuits and on the individual motors wherever possible. Practically all the machines are driven by individual motors, line and counter shafting being used in comparatively few instances. The total number of motors in operation is approximately 220, ranging in horsepower from ½ to 200. All are alternating-current motors. For machine-tool operation squirrel-cage types and for train and hoist duties wound-rotor variable-speed type motors are used. All motors rated at 1 hp. and above with but one or two exceptions are operated on 440-volt, three-phase, 60-cycle circuits.

Following the survey it was found that many of the machines were improperly motored and many changes were recommended which would improve the power factor and decrease the operating costs. It was also found advisable to recommend the installation of a number of static condensers at points later to be selected. The investment in such condensers would be well warranted by the saving which would be effected in feeder losses.

In making the tests records were taken from voltmeters, ammeters and wattmeters. Curve-drawing wattmeters were used for varying periods of time from a few minutes to twenty-four hours. In particular cases the paper speed of the curve-drawing wattmeter was increased to as much as an inch in five minutes.

The records taken were entered on forms having coordinate sections at the bottom on which might be transferred the load curves. In a few cases only were the curves transferred from the curve-drawing wattmeter charts to these data sheets. In other cases the charts from the curve-drawing wattmeters were filled with the individual power survey sheets.

An inspection of the column entitled "per cent load" indicates that many of the machines are badly overmotored; which is also evidenced from the very low power factor obtaining, although with but few exceptions the voltage applied to the motor terminals is in excess of the 440 volts required, which should increase the power factor.

A. G. HUMPHREYS,
Electrical Engineer.
Southwestern Shipbuilding Company,
East San Pedro, Cal.

The Only Bolt Works in India

BY W. J. TOMES
Locomotive Superintendent, East Indian Railway Co.

Referring to page 904, of vol. 54, *American Machinist*, the article under the above title may give the impression that bolts and the like are not manufactured elsewhere in India. I beg to state that this railway has at Jamalpur a well equipped bolt and nut shop in which all sizes of bolts, nuts, rivets, spikes, coach screws, etc., for use throughout the railway, are manufactured. A smaller equipment is also provided at the Lillooah Works of the carriage and wagon department. This railway has a mileage of 3,525 miles and operates 1,285 locomotives.

Using the Trade Magazines to Capacity

BY OSCAR E. PERRIGO

In the *American Machinist*, Vol. 53, page 489, E. L. Bowman illustrates and describes a method of "Using the Trade Magazine to Capacity," in which he shows a good beginning in the practical use of the very valuable and up-to-date articles written and collected by the editors and published in mechanical and technical journals. And right here let me emphasize very strongly the practical value of these articles, a very large proportion of which should not only be read but studied for their practical value by the professional man and by the practical man for their professional value. Both may profit much by their perusal.

The real question seems to be, do any of us really use these magazines to capacity? And to this question probably any far-sighted man, after a moment's thought, will admit that we do not; also that a very large majority of us make very little effort to utilize the great amount of benefit that the editors thus provide for us. This being acknowledged, how can we improve our opportunities in this respect?

AN IMPRACTICAL PLAN

Mr. Bowman advises that the editorial parts of each magazine be placed in a folder lettered according to

ENGINEERING DIVISION *DATE ISSUED*

This copy of the.....
is sent to you for your information. You are requested to read the articles noted after your name and promptly pass this periodical back to Mr. Perrigo, marking the date of this transfer.

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MR. DILLON.....
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MR. HARTEN.....

FIG. 1. ROUTING LABEL

an illustration which he gives and then filed in a vertical file. The next operation is the indexing. This is done on 4 x 6-in. filing cards, several of which are filled out for each article and the cards distributed to the persons likely to be interested in the subject matter filed. When one of these persons desires any special information he looks through the cards on file and selects the card or cards covering such information and then goes to the vertical file and gets the information wanted, if it is there. If another person has the article there does not seem to be any way provided by which it can be located. This method seems inconvenient and does not fully realize the idea of "using the trade magazine to capacity."

THEORY AND PRACTICE

Again, W. B. Bennett, in Vol. 53, page 69, illustrates "A Routing Panel," intended to indicate the routing that a technical magazine is supposed to take on its rounds among a number of individuals who are each supposed to keep it 48 hours and then pass it to the next man on the list. The theory is all right provided each man, however busy he may be with necessary and perhaps vital work, adheres to the schedule. However, my experience has been that it will frequently be delayed in transmission, laid aside until the man has

leisure to read it, or perhaps forgotten altogether and finally lost.

In arranging our system for a practical use of technical magazines "To capacity" both these plans and many others were considered, the subject was carefully analyzed, and as many of the shortcomings as possible

SPECIAL LIBRARY
OF
TECHNICAL INFORMATION.

Selected from the following Magazines and bound in over fifty "Snap Binders," comprising now over 8000 pages, and to which additions are being continually made

American Machinist,
Machinery,
Iron Trade Review,
Iron Age,
Industrial Management,
Factory,
Foundry,
Tool Engineer,
Engineering Production, } **English.**

ENGINEERING DEPARTMENT,
PRATT & WHITNEY CO.

1920

FIG. 2. LIBRARY LIST OF SUBJECTS (FRONT)

were avoided. By our method as soon as a magazine is received the articles, editorial and contributed, are carefully read and the pages of those especially interesting to the different officials, designers, etc., marked opposite their names on a blank (shown in Fig. 1), which is then pasted on the front cover of the magazine. It is then sent to the first man on the list. He reads the articles indicated and sends it, not to the next man on the list but back to the files, from which it is issued to the next man. Should he neglect to return it within a reasonable time the magazine is called for and issued to the next man on the list. Entries are made with a dating stamp of these issues and returns and the account is filed for future reference. Having tried different methods this is the only one we know of which insures prompt handling and reading of the magazines.

Preserving the Special Articles

While some of the articles may be of but transient interest, many of them are well worth preserving indefinitely. Therefore when the magazines have been read by the different men they are taken apart and the articles (and frequently pages of illustrated advertisments) are distributed into a series of snap binders, each containing *one subject,* or suitable division of a subject, as shown in Fig. 3. These pamphlets are then placed on the shelves of a bookcase and are issued to *any* employee applying for them similarly to books in a circulating library. Each pamphlet is represented by a 3 x 5-in. filing card headed by the title and number. The card is ruled horizontally and divided by vertical lines into three spaces. When a volume is issued the date is stamped in the left-hand space, the man's name written in the center space and the card placed in the "out" compartment of a card drawer. This shows

1. AUTOMOTIVE CONSTRUCTION.
2. BALANCING, Static and Dynamic.
3. BEARINGS, Ball, Roller, Ordinary.
4. BORING and TURNING Machines, Vertical.
5. CAMS, Design and Use.
6. CHUCKS, Lathe, Drill, Air, Magnetic.
7. CUTTING-OFF, Machines, Saws, etc.
8. DRAWING ROOM, Mathematics.
9. DRAWING ROOM, Practice.
10. DRILLING and BORING, Machines and Operations.
11. ELECTRIC and AIR Operated Small Tools.
12. ELECTRIC MOTORS and Controllers.
13. FORGING Machines and Operations.
14. FOUNDRY Equipment, Systems, Pattern Making.
15. GAGES, Manufacture and Use. A.
16. GAGES, Manufacture and Use. B.
17. GEARS and SPROCKETS. A.
18. GEARS and SPROCKETS. B.
19. GRINDING, Machines, Wheels, Operations.
20. INSPECTION and TESTING.
21. IRON, Production, Qualities, Uses.
22. JIGS, Fixtures and Special Tools.
23. LATHES, Engine, Bench, Speed.
24. LATHES, Turret, Chucking, Operations.
25. LUBRICATION.
26. MANAGEMENT.
27. MANUFACTURING PLANTS.
28. MANUFACTURING SYSTEMS. A.
29. MANUFACTURING SYSTEMS. B.
30. MILLERS, Universal, Operations.
31. MILLERS, Horizontal, Lincoln, Planer.
32. MILLERS, Vertical, Auto. Continuous, Spline, Thread.
33. MISCELLANEOUS.
34. NON-FERROUS METALS.
35. ORDNANCE WORK, Ammunition.
36. ORDNANCE WORK, Artillery.
37. ORDNANCE WORK, Small Arms, Navy, Aviation.
38. ORGANIZATION.
39. PLANERS, SHAPERS, Horizontal, Vertical.
40. POWER and TRANSMISSION.
41. PROFILERS, DIE SINKERS, Operations.
42. PUNCHES and DIES, Operations.
43. SCREW MACHINES, Hand, Automatic.
44. SHEET METAL and WIRE, Tools, Operations.
45. STANDARD TAPERS and Tools.
46. STEEL, Manufacture, Qualities, Uses.
47. THREADING, Tools, Machines, Operat'ons.
48. TIME STUDIES, Turret, Screw Machine.
49. TIME STUDIES, Miscellaneous.
50. TOOLS and TOOL MAKING.
51. TRANSPORTATION, Trucks, Cranes, Elevators.
52. WELDING, Electric, Gas, Operations.
53. WOOD WORKING, Tools and Machines.

FIG. 3. LIBRARY LIST OF SUBJECTS (INSIDE)

where the pamphlet may be found if wanted. When the pamphlet is returned the date is stamped in the right-hand space and the card placed in the "in" compartment of the filing drawer.

By this means if a pamphlet is urgently needed for some special information it contains and it is not on the shelf the filing card shows who has it and how long he has had it. If a pamphlet is accidentally mislaid the filing card shows a record of its issues and returns and through whose hands it has passed. Thus it can be readily traced.

These pamphlets are loaned to interested men to take home over night for evening reading, or over Sundays and holidays whenever they desire, which is quite frequently. We think that by our method we are emphatically "Using the trade magazine to capacity."

Making a Pressed-Steel Housing for a Universal Joint

Production Method of Producing a Small Automobile Part—Series of Stamping Operations —No Machining of the Piece—Construction of Dies Used

By H. JAY
Sales Engineer, The Acklin Stamping Co., Toledo, Ohio

THE wonderful progress made in the automobile industry in a comparatively short length of time may be attributed in part to the adoption of manufacturing methods which not only permit speedy production but eliminate all unnecessary wastage of material. Moreover, large quantity production has made it possible to invest in machinery and equipment to provide for fast and economical operations.

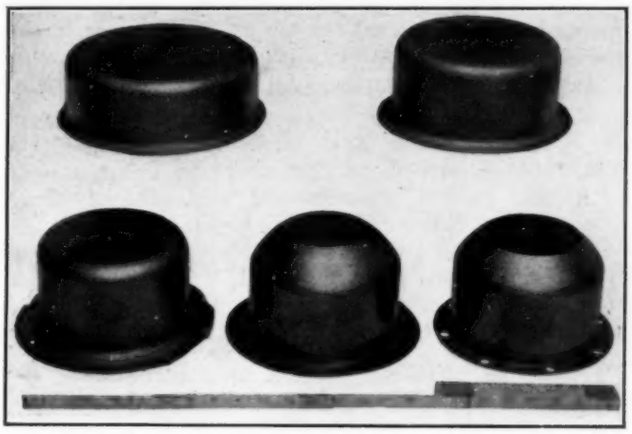


FIG. 1. STAGES OF PRESS OPERATIONS FOR COMPLETING UNIVERSAL JOINT HOUSING

The development of the metal stamping has been the means of reducing the manufacturing costs of many parts used in the automobile assembly. Parts which might ordinarily be made of cast or malleable iron, forged steel, and other materials have been replaced by pressed parts of steel and other metals. Press work permits fast production of light pieces with the minimum amount of material, and yet these parts will attain sufficient strength and stiffness.

The pressed-steel universal joint housing described in the following paragraphs was adopted by a large truck manufacturer because of its many advantages over the leather housing which was originally used for this class of work. The design of the tools and the production of the stampings are the work of the Acklin Stamping Co., Toledo, Ohio. The stages of the operation and the finished housing are shown in Fig. 1.

Those familiar with press work will note that all of the operations were performed in single-action presses and that the various reductions are so made that the work is free from wrinkles of any sort. The press equipment is similar in capacity to Bliss Nos. 74½ and 75½ presses. On runs of ten thousand or more housings, most of the operations average an output of 450 pieces per hour.

In the first operation, a blank is stamped 13$\frac{11}{16}$ in. in diameter from No. 18 U.S. standard gage, three-pass, cold-rolled, pickled sheet. The standard form of blanking die is used, with which the blanks pass through the press at each cutting stroke.

The tool for the first drawing operation is shown in Fig. 2, and the shape of the stamping is indicated by the heavy line *A*. The drawing die has the usual form for this type of tool with a cast-iron base and punch and tool-steel facings. In place of the usual wrought-iron and tool-steel draw ring, one of cast iron faced with tool steel is used—this being a less expensive construction and fully as satisfactory. A knockout pad of tool steel with the regular knockout attachment removes the work from the tool at the end of the up stroke of the press. Pressure for the pressure plate *B* is provided by five 4 x 8-in. rubbers which have just enough resistance to keep the metal smooth in drawing.

A similar tool is used for the second draw, and the shape and size of the stamping may be seen in Fig. 3.

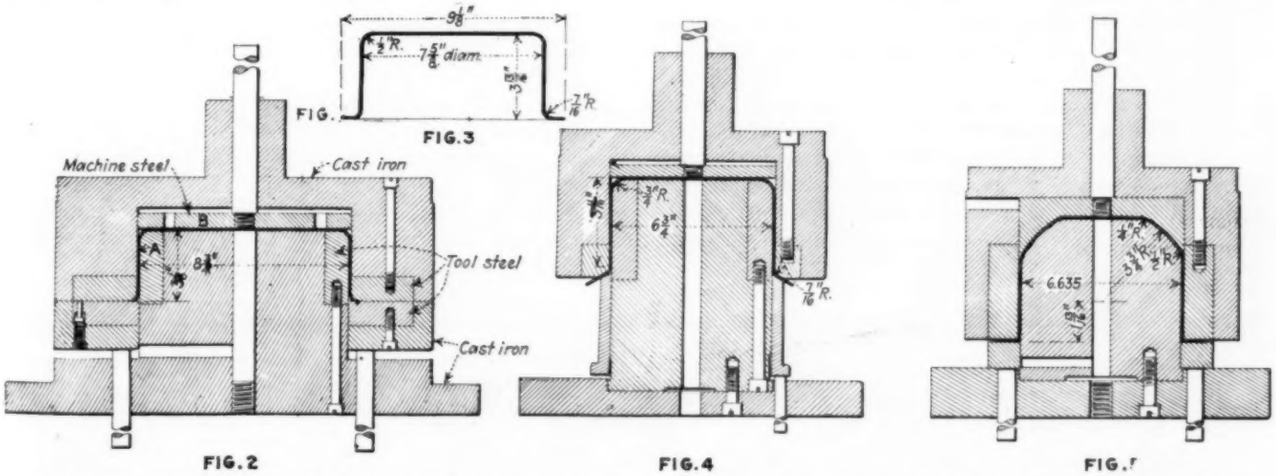


FIG. 2. DIE FOR FIRST DRAWING OPERATION. FIG. 3. OUTLINE OF SHELL AFTER SECOND DRAW. FIG. 4. THIRD DRAWING DIE STARTS TO TURN OUT FLANGE. FIG. 5. DIES FOR SHAPING WORK AND FLATTENING FLANGE

The tool for the next reduction, Fig. 4, also starts to shape the top of the stamping. The base and punch of the tool are of cast iron faced with tool steel. The draw ring is of tool steel, and in other respects the tool is similar to the one previously described. After passing through this operation the stamping has been reduced to its final diameter, and is smooth and free from wrinkles or draw marks.

To give the work its final shape and flatten the flange, the die shown in Fig. 5 is used. By striking bottom at the end of the stroke, the radius at the flange is held to a minimum and the flange itself stamped perfectly flat.

Piercing and Trimming

The die shown in Fig. 6 is used to cut the hole in the top of the housing. The construction is similar to that of the other dies except for a machine-steel ring operated by rubber pressure to remove the work from the cutting plug at the end of the up stroke.

The flange is next trimmed to the proper diameter and pierced for the assembly bolts. The trimming operation is performed by a built-up type of die, Fig. 7, with tool-steel facings on the cutting edges of both the die base and the punch. A cast-iron plug centers the work, and the scrap is removed quite readily by the use of scrap cutters *A*.

To pierce the holes, the die construction is the same with the addition of a machine-steel stripper plate, *A* in Fig. 8. This plate operates in such a way that the work is raised to clear the die before it is stripped from the punch by the knockout.

The stamping as it comes from the last press operation is ready with no machining to assemble with the other parts of the universal joint. As a housing, it is light and durable and a good protection from the weather.

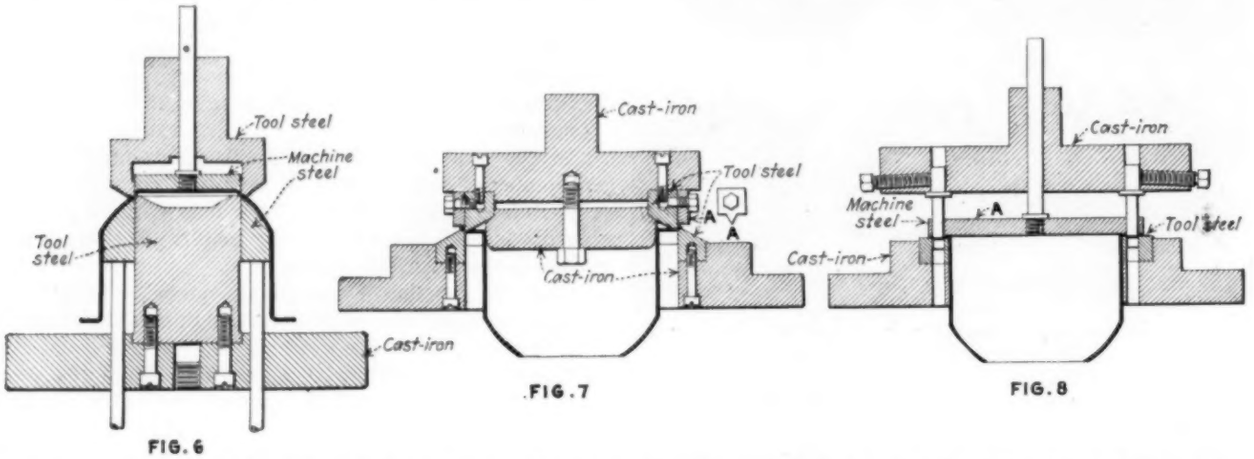


FIG. 6. CUTTING HOLE IN TOP OF HOUSING. FIG. 7. TRIMMING DIE FOR FLANGE OF STAMPING. FIG. 8. DIE FOR PIERCING ASSEMBLY-BOLT HOLES

Cost From the Shop Buyer's Standpoint

By W. Burr Bennett

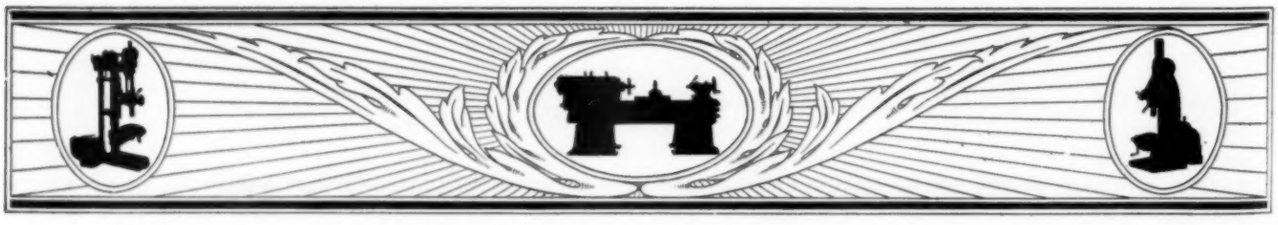
Even though these are strenuous days for the small and large shop, almost every one is doing a little work which means not only the purchasing of some raw material to make up the shortages in existing inventories, but the purchasing of supplies and perishable tools, and, although not running into much money, the buying of some equipment. Because these three items of supplies, perishable tools and equipment are "necessary evils" in the plant's existence, no matter how slow the business is, there is a very widespread inclination to consider only the lowest first price.

First price or the purchase cost—it certainly is human nature to seek the lowest, and providing specific specifications be written it is good business to buy at the lowest price, all things considered. But the point we wish to make is that far too many shops are buying these items at a price they little think they are paying.

Just a small example: All shops buy brooms of some sort or other, and for sake of example, without knowing the price of brooms right now, let us say that two prices are submitted to the man who purchases; the first of $20 per dozen and the second of $30 per dozen. Unless the fact that the second broom will wear say five months as against one month for the first is taken into consideration, the buyer can make a very expensive mistake. The brooms at $20 per doz. are by far the more expensive.

And we are not exaggerating. We have found in our own plant that good things cost the most and that, to use a very common expression "they are cheapest in the long run."

Probably the above expresses what every man on the job knows, but a little glance through some of our shops will show that it is not always practiced.



An Experiment in Railroad Repair Work

Securing Greater Interest by Local Management — Improved Machinery and Buildings—More and Better Work—An Unusual Safety Sign

By FRED H. COLVIN
Editor, *American Machinist*

RAILROAD shops have never been noted for economy in repairing or building locomotives. The machine equipment has nearly always been inadequate, and the lack of any apparent connection between the men and the owners has contributed to the unsatisfactory results. Occasionally a master mechanic or shop superintendent with a strong personality would secure co-operation and improved results. But the uncertain tenure of office of railway officials on most roads, and the lack of personal interest and responsibility due to working for an intangible thing—the huge corporation—have seldom resulted in satisfactory costs in railroad-shop work.

Old machine equipment in most railroad shops and the necessity of "fudging" up devices to do regular work because the management refused to supply standard or special machines, have led to great inefficiency in many places. The cost of makeshift devices has never been fully appreciated and, worst of all, the practice has led to a carelessness of thought regarding real costs.

The Erie Scheme at Hornell

The war brought extra stresses on railroad shops as on all other industries and, as in many other cases, the individual efficiency dropped from a number of causes. In order to secure an improvement in efficiency and to see the effect of private management in a railroad shop, the Erie R.R. has been trying an interesting experiment during the past year. On March 6, 1920, it leased its shops at Hornell, N. Y., employing about 800 men, to the Hornell Repair and Construction Co., organized especially for the purpose. This is a corporation consisting of five stockholders, all well known in Hornell and representing a diversity of interests, such as shoes, groceries, gas and electricity, and banking.

The terms of the lease provide a minimum amount which the new company is to receive for railroad-repair work. On all work beyond this amount, the railroad receives a percentage of the profit made. And, in addition to the railroad work, the new company handles repair work of all kinds, such as stationary boiler and engine work, sawmill machinery, road-making machinery and the like.

The experiment is largely a test of management and an effort to establish personal relations between employer and employee. The wages and hours are the same as in railroad shops and the men present their requests and grievances through shop committees. As can be imagined the new plan caused considerable suspicion in the beginning. Any new movement of the kind always does and with almost any class of men. Ulterior motives were naturally ascribed to the change and it took considerable tact on the part of the management to prevent a break before the plan had a fair trial. Robert W. Bull, who is the executive chairman of the new company, gives the shop superintendent T. S. Davey credit for maintaining harmony during the critical period. This was only made possible because Mr. Davey had been with the Erie at Hornell for several years before the change was made and had established an enviable reputation for fairness in all his dealings.

Now that the suspicion has worn off, the men are apparently happier and more contented than before. Likewise they are turning out more work per man, partly because of better machine equipment and partly because they are taking more interest in the shop. It is now a local affair instead of part of a big system with an unknown "big boss" several hundred miles away. They can get much quicker action on all questions, grievances or otherwise, than ever before. There is very little red tape and no long waits for matters to go through the maze of channels that exist in the average large railroad office.

The only routine now in force is that all questions must go through their proper channels, the foreman and the shop superintendent. The door of Mr. Bull's office is open to any man in the organization. And the men like it—delays often fan a smoldering spark into a real blaze.

The men are now paid weekly, in cash, instead of semi-monthly by check. They also have transportation privileges which have always been a part of the railroad man's job. Although the new company cannot issue passes, it does even better. It issues orders on the Erie R.R. for first-class tickets, which can be obtained from the station master and which permit the holders to ride on any train.

The Erie R.R. has no control of the shops during the continuance of the lease. But it maintains inspectors at the shops to be sure that it is getting the proper quality of material and work, and it is common talk that the inspection is much more rigid than ever before.

Up-to-Date Equipment and Safety Appliances

The shop equipment, while still inadequate, has been improved by the addition of several new machine tools and more are to come. Among those already installed are a Bullard vertical turret lathe, a large American radial drilling machine, a Gould & Eberhardt shaper and a Marvel power hacksaw. There is also new electric welding and flame welding and cutting apparatus and equipment for thermit welding.

Other improvements consist of a substantial and sanitary house containing wash rooms and toilets, and an emergency hospital with a nurse always in attendance. Considerable attention is also being paid to safety work and there is an air of improvement which is not found in many railroad shops. Part of the safety work consists in good-size signs with large letters so as to be easily read. These are in some cases lessons in the fundamentals of economics as well. One sign in particular, ties up the whole subject as follows:

WEALTH DEPENDS UPON PRODUCTION
PRODUCTION DEPENDS UPON EFFICIENCY
EFFICIENCY DEPENDS UPON HEALTH
ALL DEPEND UPON SAFETY

While figures of comparative costs of the work done are not available it is stated that both the railroad and the new company are satisfied with the results secured. The men in the shop seem to take a greater personal interest in their work, which is both natural and desirable. The men in the other shops along the line are naturally interested in the experiment and it is understood that they have a feeling that they must not be beaten by the Hornell shop.

Improvement in efficiency at Hornell very naturally puts it up to the other shops to do as well or to look for a similar change of management. Whether such a plan on a nation-wide scale would be advisable, is a subject for serious consideration. It presents the advantage of securing a greater personal interest than has so far been possible with most large corporations. It also points out the weakness of many railroad shops in machine equipment and in suitable buildings and other facilities. Whether great transportation lines can be dependent on individual and separate shops for all their work, is another question.

The experiment is, however, one of great interest at this time, and has many lessons to be taken home for serious study by both railroad officials and the men in the shops.

A Matchplate Pattern for Small Castings

By E. A. Dixie

I have written before of some of the clever expedients used by our boss patternmaker to get out good work in a hurry, or to evade excessive pattern expense where but a single, or at most a few castings, were needed, and he is just as resourceful when it comes to quantity production.

The other day an order came in for some thousands of the small casting shown in Fig. 1. The customer sent a single, nicely finished, little pattern made of iron which the foundry "super" handed to the boss patternmaker with the information that there were so many thousands of that piece wanted.

In Figs. 2 and 3 are shown both sides of the match plate pattern after the boss patternmaker was finished with it. There is nothing extraordinary about it, but there is about the little kinks which were used to get it out—and get it out quickly. The illustrations will help to carry the thread of the story.

It was decided to place fourteen patterns on the matchplate *A*, Figs. 2 and 3. The centers of their location were laid out on the board and fourteen ½-in. holes drilled through the board.

The next operation was making the parts *B* and *C*, Figs. 1 and 2. These two parts were made in a single piece as the parting of the pattern was along the line *XX*, Fig. 1. In order to avoid confusion similar letters will be used to indicate similar parts throughout this article.

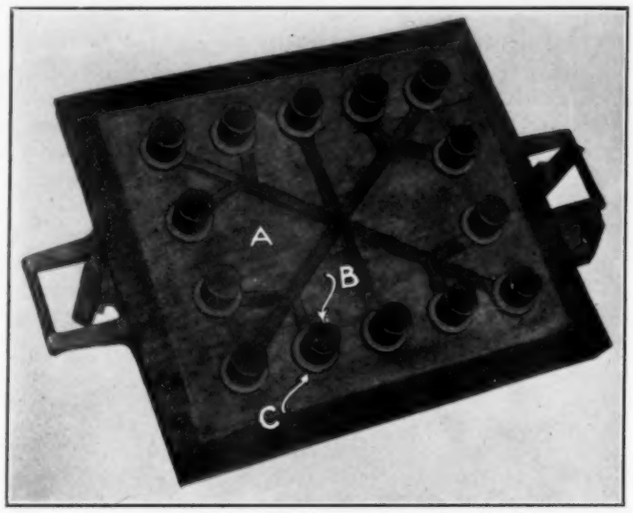


FIG. 2. DRAG SIDE OF MATCHPLATE

FIG. 3. COPE SIDE OF MATCHPLATE

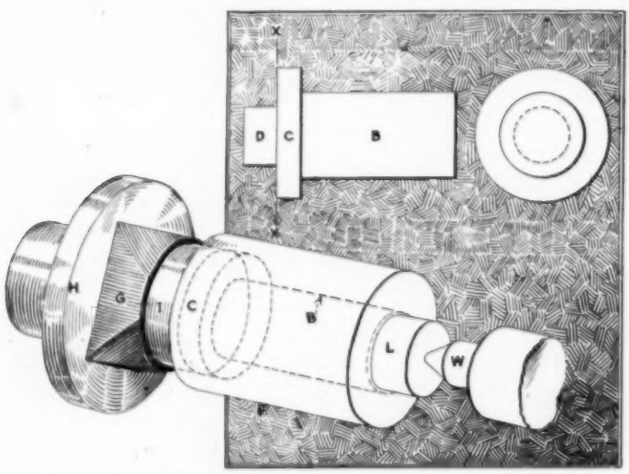


FIG. 1 (ABOVE) THE CASTING. FIG. 6 (BELOW) METHOD OF TURNING *B* AND *C*

For the parts *B* and *C* a piece of mahogany was sawed and planed square. Its length was sufficient to make the fourteen pieces and its thickness was a little greater than the diameter of the flange *C*, Figs. 1 and 2.

This piece of wood was then taken to the band saw and sawed into fourteen pieces a little longer than the finished length of the parts *B* and *C*. The pieces then went to the Fox trimmer and one end of each piece was trimmed square with the sides. A wooden stop *E*, Fig. 4, was then clamped to the Fox trimmer as shown and each one of the blocks, as shown at *F*, was dressed to length, thus making the dimensions of all the blocks identical. It will be noted that the block *F*, Fig. 4, is shown with the trimmer cut half-way through it.

Lines were then drawn from corner to corner, across

one of the ends of each of the pieces, and at their intersection in the center of the piece a ¼-in. hole was drilled about ⅜ in. deep.

The next job was to prepare the spur chuck shown in Fig. 5. A piece of hard mahogany *G* was secured to

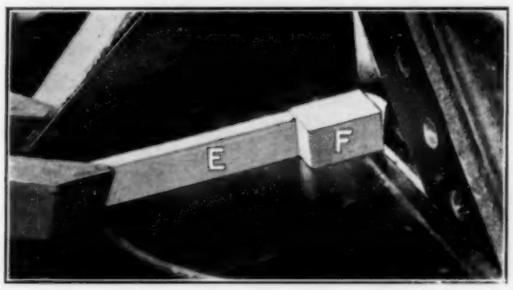


FIG. 4. FOX TRIMMER WITH STOP CLAMPED IN PLACE

the face plate *H* by screws. The diameter *I* was then turned the same size as the flange *C*, Fig. 1, so that when turning the pieces *B* and *C* no calipering would be necessary to determine the size of this flange. All the patternmaker would have to do would be to turn them to the same size as the diameter *I*, Fig. 5.

The face of the chuck was then turned flat and a ¼-in. hole drilled in its center. Two stout brads were driven into the face of the chuck to form the spurs *J*. These were cut off to leave about ⅛ in. of their length projecting and the points were filed sharp. A ¼-in. dowel *K* was then driven into the ¼-in. hole in the center of the chuck and cut off about ⅜ in. from the face.

The rectangular blocks were then taken one at a time. The ¼-in. hole in the one end was placed over the dowel *K* in the chuck. A piece of hard wood *L*, Fig. 6, with a center in it was placed between the other end of the block and the tail center *W* of the lathe and the center run in. This forced the work against the face of the chuck and the spurs *J* of the chuck into the end of it so that they could act as drivers. The arrangement is shown in the line engraving, Fig. 6, where H is the faceplate, *G* the wooden chuck turned down at *I* to the diameter to which it is intended to turn the flange *C*. The letters *B* and *C* indicate the piece to be turned and *L* the piece of hardwood which steadies the tail end

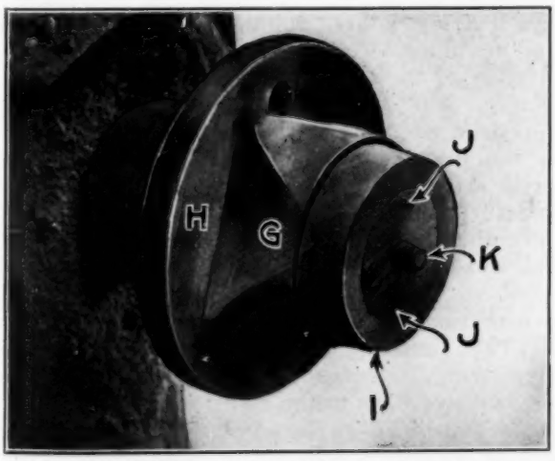


FIG. 5. WOODEN DRIVING AND CENTERING CHUCK

of the work and forces it against the chuck. By dotted lines at *B* and *C* are shown the final turned dimensions of the work.

As all the blocks had been cut to exact finished length on the Fox trimmer, all the turner had to do was to turn the part *C* down to the same diameter as the part *I* of the chuck. His only reasurements being the thickness of the flange and the diameter of *B*.

The making of the small part *D*, which fell on the other side of the parting line and on the other face of the match board, shows another example of ingenuity.

A piece of mahogany was dressed to the thickness of the piece *D*, Figs. 1 and 3, and to a width a little more than its diameter. This was then cut into fourteen squares. Cross lines were drawn as on the other pieces *B* and *C* and ¼-in. holes drilled at the intersection of the lines. One of these square pieces of wood is

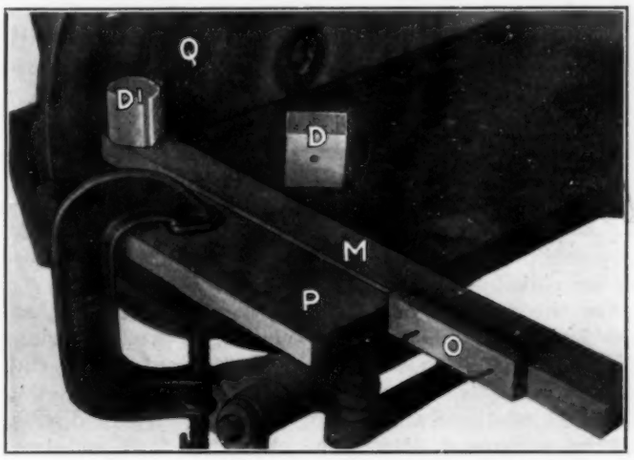


FIG. 7. SHOWING OPERATION OF THE JIG

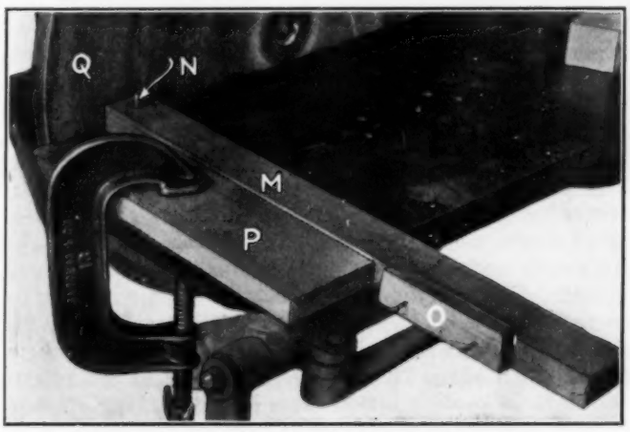


FIG. 8. SIMPLEX JIG FOR SHAPING PART *D*

shown at *D*, Fig. 7, the hole in its center showing plainly.

The rest of the work on this part was done on the sand disk.

The patternmaker prepared a simple little jig which insured all the pieces being exactly the same.

The piece of wood *M*, Figs. 7 and 8, was planed 2 in. wide by about ¾ in. thick. About ½ in from one end a ¼-in. hole was drilled and in this hole a dowel *N*, Fig. 8, was driven and allowed to project about ⅜ in. Near the other end of *M* and on the side of it a stop *O* was secured by brads. A guide piece *P* was then made and clamped to the table of the disk-grinder in such position that when the stop piece *O* on *M* came in contact with the end of *P* the center of the pin *N* would be one-half the diameter of *D* from the face of the sand disk.

The method of operation is shown in Fig. 7. One of the square pieces of wood *D* is placed over the dowel pin *N* and the member *M* pushed forward bringing this piece marked D^1 in contact with the revolving sand disk *Q*. The operator then turns the piece *D* with his fingers, the sand disk dressing it to the desired shape and diameter. During this operation the stop *O* is in contact with the end of *P*.

The assembling of the patterns on both sides of the board was accomplished by driving ¼-in. dowels in the fourteen ¼-in. holes which had been drilled through the match board. These dowels were allowed to project about ⅜ in. on each side of the match board and the parts *B*, *C* and *D* were assembled on each side. The ¼-in. holes in their centers greatly facilitated the work and assured that they were properly centered. The application of the runner was a simple matter and needs no explanation.

From start to finish the whole job took about three hours.

Industry in Switzerland

Swiss a Pessimistic People—Government Aiding Unemployed—Machine Tools at Low Ebb—Whole Business Dependent on Export Trade

BY ADRIEN LAMBERCIER
J. Lambercier, Switzerland

ANYBODY reading a review of the business activity of the Swiss industries, would come to the conclusion that the shops are not doing any work at present. It has been the custom of the Swiss people to complain always about the business situation.

On the other hand, it is the general opinion that the Swiss shops have made very large profits during the period of the war, when they did work for the belligerants. But financial statistics show that the fortunes of the Swiss people have been reduced, due to the extreme difficulties of obtaining food and raw materials during the war; also because the accounts of foreign customers are much depreciated due to the drop in the exchange. So as a rule, Swiss industries are no better off than the industries in other countries.

The Swiss government has two schemes for meeting the problem of unemployment: One plan is to keep as large a number of workmen as possible busy on the electrification of the railroads, and the other scheme is in the form of an indemnity for out-of-work people. According to this latter scheme, all men and women out of employment—whether office workers or laborers—can receive, after they have been unable to find a new position, an indemnity for three months amounting to from eight to twelve francs a day, this in some instances being nearly equal to what they earned in their former positions. This plan has encouraged much laziness and lack of ambition among the working classes. Of this indemnity, one-third is paid by the State, one-third is paid by the county or town, and the other third is paid by individual concerns or associations of concerns.

LITTLE CHANGE IN WAGES

It cannot be said that the wages have been lowered very much as a general rule. A good mechanic still gets from 1.80 to two francs an hour (thirty to thirty-five cents) and unskilled labor from 1.20 to 1.60 francs an hour (twenty to twenty-six cents).

The high cost of living is responsible for the unwillingness of labor to accept lower wages, but the reduction of probably 15 per cent has been usually accepted, while manufacturers are selling their goods now at a reduction of about 40 to 60 per cent less than the high peak prices, so that Swiss manufacturers are not really working for profit under the actual scheme.

Switzerland having no iron or coal mines, with possibly a very few exceptions not worth mentioning, the manufacturers are dependant on foreign countries for their supply of raw materials. Because iron as a rule is still worth about one franc a kilo—or one dollar for about thirteen pounds—in the small tool line, it is believed that the few concerns who started making small tools during the war will not stand and that very few of the old, established concerns will be able to continue.

LITTLE MACHINE-TOOL BUSINESS

In the machine-tool line manufacturing was carried on to a very large extent in Switzerland during the war. It will be remembered that before the war, there was only one concern manufacturing metal-working machinery in Switzerland that would be worth mentioning. There were a few other concerns making small drill presses and some others grinding machines, including the surface grinders. Many small precision bench lathes and precision bench milling machines for the special requirement of the watch making trades, were also produced.

Under the present depression, it is likely that only two concerns will remain manufacturing machine tools of medium size, in Switzerland—Bennezer & Co., of Uzwil, and the Swiss Machine Tool Works, of Oerlickon—the former concern making lathes only and the latter concern making lathes, milling machines and radial drilling machines. The former concern has added lathe manufacturing to its former line which was knitting machinery. The second concern may be incorporated with a large electrical works in Oerlickon.

So, the machine-tool industry in Switzerland will comprise about a half dozen concerns, including those manufacturing the small drill presses and gear cutting and grinding machines, exception being made for the special small precision machine tools for the watch industry.

German competition is, of course, to be reckoned with. The German machine-tool manufacturers are offering their machines in Switzerland at dumping prices, but according to the actual cost of manufacturing these machines in Germany, dumping prices even mean a profit to the manufacturer to an amount averaging not less than 25 per cent.

Switzerland has also been covered by commercial propaganda from Sweden and Holland. Many concerns in these countries are offering very large stocks at attractive prices. Their efforts were in vain, however,

because the Swiss market is unable to consume, under actual conditions, any important amount of machine tools. A very small amount of machine tools was purchased by Swiss concerns having orders for the electrification of the railroads.

Electrification of Railways

The Swiss government has lately issued bonds for 100,000,000 francs at the rate of 6 per cent, to be reimbursed after ten years. It will be remembered that the United States has already loaned Switzerland several hundred million francs for carrying out the plan of electrifying the railroads. According to this plan the first large railway system in Switzerland will be electrified within twenty years, and the smaller lines will require from ten to fifteen years more.

Electric locomotives of the single-phase type, for 600-hp. motors, are now being built in about a half dozen large electrical manufacturing plants. Of course, other shops making switches, electric meters, transformers, connecting outfits, switch-boards, etc., are normally busy and also a few large plants making high-pressure water turbines and electric generators for the electric power plant.

In the electrical industry the large firms, outside of the government work, have very few orders booked in advance for foreign countries, but it is likely that the revival of the export business in Switzerland will create a demand for machine tools, as very few machine tools have been bought to meet the manufacturing requirements of the government orders. Due to some reduction in wages and to better manufacturing processes, a few electrical shops in Switzerland are able to export their electric motors into France, which country has always been a very good customer.

In the railroad repair shops, it is the rule not to make any purchases of machine tools, a few exceptions being granted for small tools necessary for the up-keep of material. This is due to the situation of the Swiss railroads who have had their expenses over-balancing their income for several years.

Swiss manufacturers are allowed to export only a certain number of watches to France. Before the war, Germany was a very good customer for Swiss watches and some important houses in the German sea ports made very large contracts and exported Swiss watches the world over. This trade started again soon after the armistice, but Swiss watch manufacturers have been compelled to suspend their shipments due to the German houses not being able to meet their obligations as the mark went down further, and large accounts are now due to Swiss manufacturers by German import houses. The Swiss watch industry is very dull at present and the factories work between fifteen and eighteen hours a week.

In the textile branch, manufacturers are unable to obtain orders for Swiss consumption because the retailers are selling out their stocks at prices below actual manufacturing prices and as long as stocks last, manufacturing will not be started again. The higher classes are still using imported English goods.

The lace industry is reviving a little due to some orders being received from England. The prosperity of this trade depends upon the fashion.

The leather industry is in better condition, due to a very high tariff preventing the importation into Switzerland of foreign leather goods. It is figured that a 40 per cent duty is to be paid on foreign imported leather goods, so that the Swiss shoe and leather goods manufacturers are enjoying profitable manufacturing. But this protection against competing foreign goods has been much discussed by the press as being detrimental to the lowering of the cost of living.

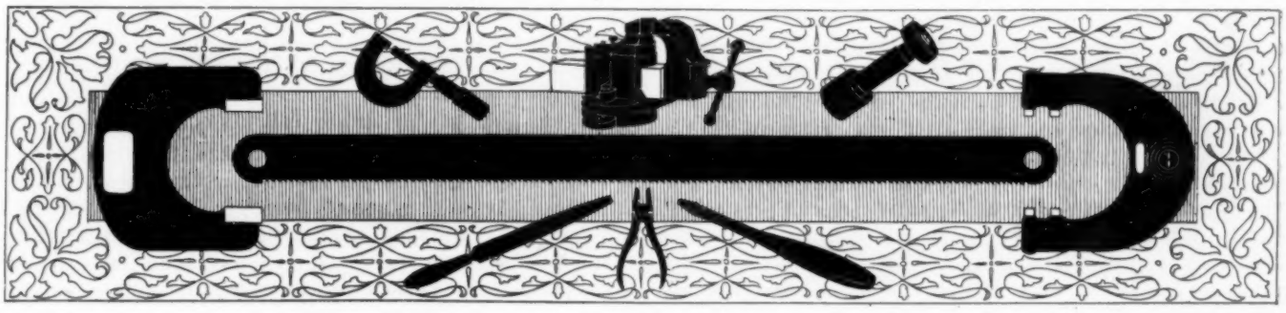
Automotives Quiet

The automobile industry is very quiet in Switzerland. Very good trucks are being manufactured by Swiss work shops, but a great many foreign trucks—a large number of them coming from the army stocks in France—and the liquidation of the stocks of manufacturers in Germany and France, provide enough trucks for many years' consumption in Switzerland. A large truck manufacturing concern—Saurer—is working with a much reduced force and only a few days a week. Other truck manufacturers like Frank are closed, and Martini is working with but a very small force. It is believed that hardly any touring cars will be manufactured again in Switzerland, due to the inability of Swiss shops to meet competition in manufacturing costs and the failure of the large automobile concern Pic Pic of Geneva. I should make exception to electric automobiles, which could find a market if electric power could be obtained cheap enough.

The wood-working industry is suffering less than the metal-working industry and if building construction should start again this industry would be the leading industry at the present time.

The recent new tariff regulation applying since July first on imported machine tools and small tools and shop supplies, is affecting to some extent, the machine-tool business. This tariff calls for an increase of from 100 to 150 per cent on machine tools, according to the respective classification of weight; small tools will pay 150 to 400 per cent more; the usual shop supplies will pay 100 per cent more and precision instruments will pay 300 per cent more than previously.

To conclude, Swiss industry lives on export trade and as long as business conditions do not improve in foreign countries so that Switzerland may export her goods, it is not likely that Swiss industry will be active, with the exception of those plants interested in the electrification of the railroads.



Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Device for Setting the Wires in "Lantern" Pinions

BY AMOS FERBER

The built-up pinions used in clocks and watches, commonly called "lantern" pinions, are composed of "spools" of brass having steel wires set in holes drilled through the flanges near the periphery in a direction parallel to the axis of the spool, the wires serving the purpose of "teeth" in the pinions.

The spools are turned out at a rapid rate on small automatics, and are drilled in a special machine that indexes the spool around in the same manner as a gear would be indexed, drilling each successive hole clear through one flange and part way through the other. It then remains to set in the small steel wires and swage them in place to prevent them from working out.

Modern clock making demands hundreds of thousands of these pinions of different sizes and varying numbers of teeth and as the wires even in the largest sizes are very small and correspondingly short it would require too much time to set them individually with a pair of tweezers; therefore some sort of device is needed to set them simultaneously with speed and certainty. The illustration shows such a device worked out by the Lux Clock Co., Waterbury, Conn., to accomplish this purpose.

In the barrel of the fixture at *A* a cylindrical plug having a semi-rotary movement operated by a treadle has a ring of holes drilled lengthwise through it, corresponding in location and size to the wires in the pinion. This plug does not pass entirely through the barrel, but abuts against a stationary die of exactly the same section and of a thickness corresponding to the length of the wires in the pinion. The die is held in the front end of the bore of the barrel by suitable setscrews. Both die and plug are, of course, interchangeable with others to accommodate different sizes of pinion.

Each die has a short stud projecting from the center to fit the bore of the pinion and thus position it to receive the wires. In case of pinions in which the spool is already swaged in place on its respective shaft, the die and plug each have a central hole to perform the same function. At *B* is a swinging stop that determines the length to which the wires shall be cut.

With the treadle at its upper position where it is held by a spring against an adjustable stop, the ring of holes in the plug coincides with that in the die. A bundle of steel wires—seven, nine, or more according to the number of "teeth" in the pinion—is threaded into the holes and bound together at the outer end by a suitable clamp in a position to be convenient to the operator's left hand.

Swinging the stop *B* to its central position, the wires are advanced to meet it, when a depression of the treadle rotates the plug sufficiently to cut them off, leaving the die filled with wires of the proper length. The thickness of the die is about $\frac{1}{64}$ in. less than the required length of wire and the stop set correspondingly, so that these wires project slightly from the face of the die.

Picking up a spool with the right hand, the operator sets it over the central stud and with a slight twisting motion, enters the wires in their respective holes; the wires are prevented from moving back by the blank face of the plug now presented to their inner ends. Releasing the treadle, thus bringing the holes once more into coincidence, the operator advances the bundle of wires with her left hand, pushing the short pieces into places in the pinion and filling the die ready for the next one.

In the device at the right there is at *C* a constantly running knurled wheel driven by the round belt. Two upright shafts at *D* and *E* each carry a small gear with teeth made to mesh with the pinion. Both these shafts rotate freely on pivot bearings but are not turned by the driving belt. Neither do the two gears mesh together, but are set so that when a pinion is put between them it will mesh with both and act as an intermediate gear without having any fixed center of its own.

The shaft at *D* has a slight endwise movement operated by a second treadle. Without depositing the newly filled pinion (which would allow one or more of the wires to become displaced) the operator places it, with the open end of the holes up, between the gears of the swaging device and depresses the second treadle. This movement forces the flange of the pinion against the revolving knurl, which thus becomes the driver and rotates the pinion and the gears with which it is in mesh.

DEVICE FOR SETTING WIRES IN LANTERN PINIONS

The gears have no other office than to support the pinion and allow it to revolve under the knurl, which thus runs around the face of the upper flange and swages the soft metal into the drilled holes, effectively closing them and securing the wires in position. Meanwhile the operator is loading another pinion and pays no

further attention to the swaging device other than to keep her foot on the treadle until the next pinion is ready to be inserted.

When the pressure on the treadle is released the pinion drops out and makes way for the next. The two operations are thus carried on together and the time required for loading and swaging a pinion is but a matter of two or three seconds, against as many minutes that would be required were the wires to be inserted and swaged individually.

Handling Materials in Western Shops

By Frank A. Stanley

The halftones illustrate methods and apparatus used in various western plants for handling materials of different kinds. Fig. 1 shows the application of a handy

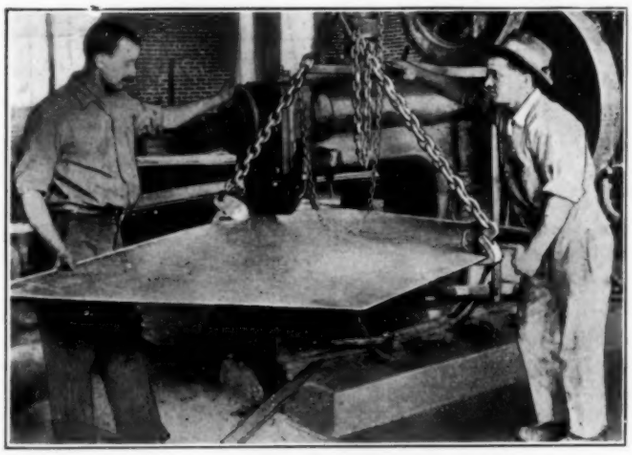


FIG. 1. CONVENIENT HOOKS FOR HOLDING METAL PLATES

sling, as used for lifting plates in the shops of the Nevada Engineering Co., Reno, Nev. The grab hooks by which the edges of the plate are securely gripped, have broad bases of heavy metal bent to extend well under the edges of the plate, while in the forks of the upper ends are pivoted cam shaped forgings through the tops of which are passed links of the chain slings. The lower ends of the cam-shaped members are so shaped that the greater the weight of the work, the more tightly will the hooks grip the sheet.

In Fig. 2 is shown a sling for picking up driving wheels and axles for placing in the wheel lathe and for

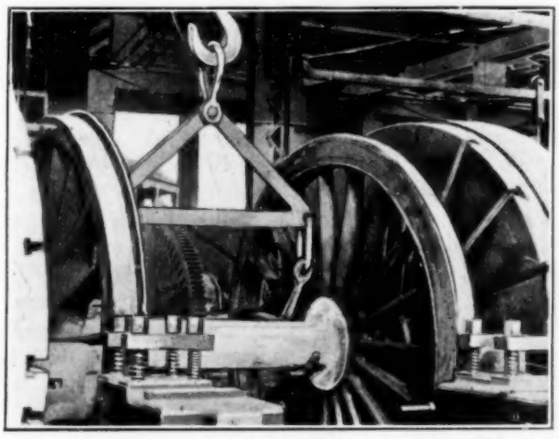


FIG. 2. SLING FOR HANDLING LOCOMOTIVE DRIVING WHEELS AND AXLES

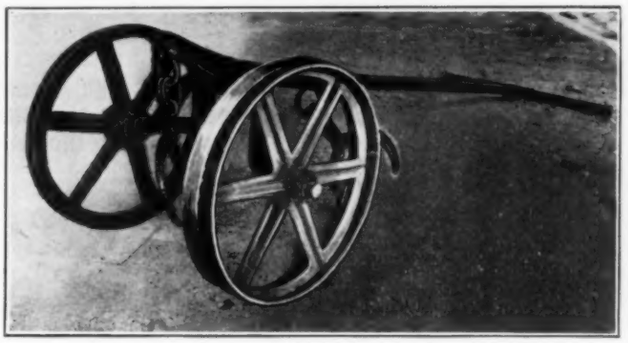


FIG. 3. TRUCK FOR HANDLING SHORT SHAFTS

removing them after completion of the turning operations. The sling has a triangular body fitted with a clevis for suspension by the crane hook and has two large hooks at opposite ends for supporting the driving axle.

Special Truck for Short Shafts

In Fig. 3 is shown a special truck used in the Nevada Engineering Works for picking up heavy shafts, axles and similar work. This truck is quite similar to some of those used in railroad plants for handling driving axles. The truck is entirely of metal with the axle bent upward to bring the handle at sufficient height above the floor to permit the two "ice tongs" gripping hooks to clear the surface of the ground when the truck is in motion. The truck is simply run over the axle or short shaft to be lifted, the tongs dropped over the work and the entire outfit can then be used to carry the shaft to any desired point.

The stand or table shown in Fig. 4 is in reality a

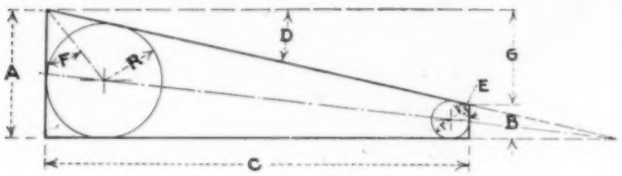
FIG. 4. DEVICE FOR HANDLING HEAVY PRESS TOOLS

truck having two wheels at one end and handles at the opposite end to enable it to be moved from point to point, as in the pressroom where heavy dies have to be handled to and from the storage benches and presses. The top of the framework is fitted with a pair of light rails which are of the right height to come practically flush with work benches and with storage shelves back of the presses. Heavy bolsters, dies and punches can be slid directly from the benches onto the top of the truck or vice versa and the handling between truck and press bed is accomplished with equal facility. This is one of the appliances used by the Gilro Machine Co., at Oakland, California.

Taper Gage Disks

By G. Strom

Figuring the diameters of disks used to set the final taper of gages, or checking similar work when the angle of taper is as shown in the accompanying illustration is often very puzzling. No solution is given in the standard handbooks that I have examined. I have seen much time spent in trying to solve this problem by ordinary arithmetic, using a formula in which both angles are equal, and adding or subtracting constants.



MEASURING A TAPER BY MEANS OF DISKS

The problem is easily solved by trigonometry:

$$G = A - B$$

$$\text{Tan } D = \frac{G}{C}$$

$$\text{Angle } F = \frac{90^\circ - D}{2}$$

$$\text{Angle } E = \frac{90^\circ + D}{2}$$

$$R = \frac{A \times \text{Tan } F}{1 + \text{Tan } F}$$

$$r = \frac{B \times \text{Tan } E}{1 + \text{Tan } E}$$

Following is a solution of an actual problem:

$A = 0.7$ in.; $B = 0.2$ in.; $C = 4$ in.

$G = 0.7 - 0.2 = 0.5$ in.

$$D = \tan^{-1} \frac{0.5}{4} = \tan^{-1} 0.125 = 7^\circ\ 8'$$

$$E = \frac{90^\circ + 7^\circ\ 8'}{2} = 48^\circ\ 34'$$

$$F = \frac{90^\circ - 7^\circ\ 8'}{2} = 41^\circ\ 26'$$

$\text{Tan } E = 1.1329$

$\text{Tan } F = 0.88265$

$$R = \frac{0.7 \times 0.88265}{1 + 0.88265} = \frac{0.617855}{1.88265} = 0.3382 \text{ in.}$$

$2R = 0.6764$ in. diameter of disk at large end.

$$r = \frac{0.2 \times 1.1329}{1 + 1.1329} = \frac{0.22658}{2.1329} = 0.1062 \text{ in.}$$

$2r = 0.2124$ in. diameter of disk at small end.

Method of Making a Small Eccentric Bushing

By Gus Haessler

The small eccentric bushing shown at *A* in the cut is a part of a gage, six of which were to be made. The dimensions, including the amount of eccentricity which was 0.025 in., were required to be very accurately maintained and the method here described of doing the work was adopted.

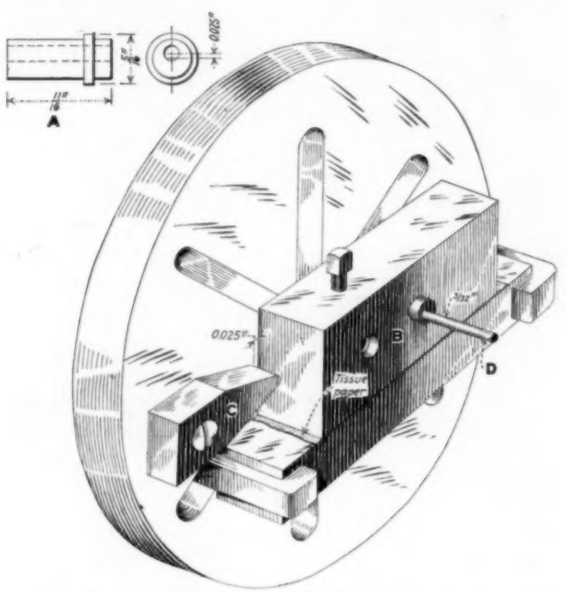
The bushings were made of ⅜-in. drill rod and, after being roughed out, were drilled and reamed by means of the jig shown at *B*. A piece of cast iron of suitable dimensions was first machined square and true, and a hole for the setscrew drilled and tapped near one end.

Mounting the piece upon the faceplate of a bench lathe to which a parallel had previously been clamped, and with the work bearing upon strips of tissue paper placed between it and the parallel, the work was positioned and a hole bored transversely to the setscrew hole to take the bushings.

The locating piece *C* was then clamped to the faceplate to bear against the end of the jig and the latter moved along the parallel for the distance of 0.025 in.; being located in its new position by means of feeler gages between it and the locating piece. It was then an easy matter to drill and ream as many of the bushings as desired, holding them by means of the setscrew.

The same jig and methods were used in grinding the bushings after hardening. Another hole was made in the piece to take the shank of the stud *D*, and when this had been hardened and ground the jig was moved 0.025 in. along the parallel by the use of the locating piece *B* and feelers, as before.

Two or three thousandths of stock had been left upon the bushings for grinding, and it was only necessary to force the bushings lightly upon the stud and indicate them true, when they were ready to grind.



JIG FOR DRILLING AND GRINDING SMALL ECCENTRIC BUSHINGS

Cylinder Valve Seat Gage

By Charles Kotersall

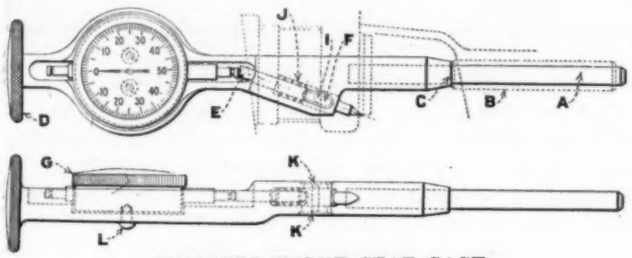
Chief Tool Designer, Peerless Motor Car Co.

The gage shown and illustrated here may be of interest to the readers of the *American Machinist*. It is used for checking the concentricity and run-out of cylinder valve seats on automobile cylinders.

The stem or plug of the gage at *A* must be a close sliding fit in the valve stem guide bushing *B*. The gage must bear on the shoulder of the guide at C. This is done by pushing down on the knurled knob D. This being done the plunger E works in the slot F and has about ⅛ in. on both sides of the center, as shown on the gage. The bezel ring *G* of the dial gage is set to zero. The knob is now turned at the same time the stem *A* is at stop *C*. In other words "push down and turn."

If there are any irregularities on the seat of the cylinder the gage will show them. The pin *I* is to pre-

vent the plunger *E* from turning and springing out. The spring *J* is a compression spring compressing on the plunger against the cylinder valve seat. The cover *K* is to prevent dust from getting into the slot *F*. It is held in place by peneing the edge of the opening into



CYLINDER VALVE SEAT GAGE

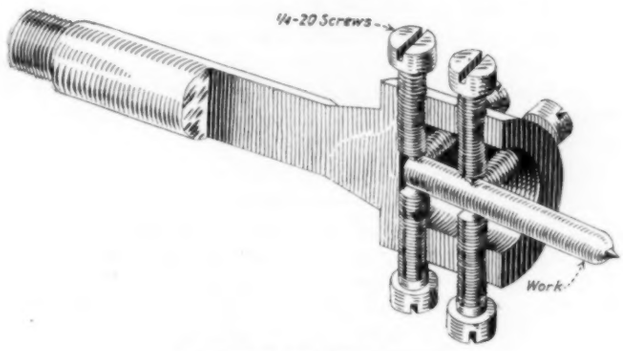
which it fits. The screws *L* hold the dial gage in place. The dial gage used is a No. 9, B. C. Ames gage which has a spindle travel of $\frac{5}{16}$ inch.

A Collet Chuck for Truing Up Irregular Work

By Richard B. Hawes

We had occasion to set a number of diamonds in such manner that the points would run absolutely true, and as it was impractical to accomplish this result when brazing the diamonds into the holder, it was necessary to devise some means of truing up the point after setting so as to turn off the outside of the holder. After spending many fruitless hours in trying to do this by means of a four-jawed independent chuck and sundry pieces of blocking, we devised the simple tool shown in the sketch.

The shank of the tool was made to fit the spindle of the bench lathe and the outer end was left $1\frac{3}{8}$ in. in diameter by 1 in. long. A $\frac{7}{8}$-in. diameter hole was bored $\frac{7}{8}$ in. deep into this head, and into the annular wall thus left, holes were drilled and tapped and eight $\frac{1}{4}$-in. set-



A SIMPLE COLLET CHUCK

screws inserted in rows of two as shown. With this tool it becomes a simple matter to true up the diamond point, irrespective of its position in the holder.

The device is useful also for other work beside that for which it was intended.

Keeping Records of Tools

By Gene Phelps

An accurate record of what a cutting tool can be expected to do, or has done, is very useful when determining the best tool to use for a certain kind of work or the best speed to produce the most satisfactory results. Many factories run machines at speeds which are not efficient, this being largely due to the use of improper cutting tools. If a certain piece of work is to be done and a record has been kept on something of a similar nature, it is a very easy matter to make a selection of a type of tool which will bring the desired results.

The tool record card shown here has been found exceptionally useful in determining the best tool for cutting a piece of work under a given condition. The correct feed and speed is recorded on the card, and the actual tests shown in the record practically eliminate guess work. Records can be accurately kept on such machining operations as turning, drilling and milling; and a reference to the card enables the engineer to observe past performances.

Very frequently some operation is found to be too slow, and the speed is increased without definite knowledge of what the increase should be. The result will be that the tool does not stand up for the required

TOOL RECORD

PART Drum shaft MATERIAL #81 M.S.

OPER. Rough turn outside diam.

REMARKS Forgings have been annealed – Material OK.

GRINDINGS

TOOL	1	2	3	4	5	6	7	8	9	10	AVERAGE
A	38	30	41	38	40	43					38
B	40	32	36	30	39	37					36
C	41	35	31	37	20	21					32
D	29	42	36	39	23	40					35

MACHINE La Blond Lathe

R.P.M. 210 FEED PER REV. .020

O.D. OF CUT 4" DEPTH OF CUT 1/16"

TOOL HARDENED 1380 DRAWN 350

REMARKS Special H.S.S. tool – size 3/4 x 1-4 used on this test – R.P.M. have been increased 10%

DATE MADE BY Phelps

RECORDING WORK DONE BY A TOOL

length of time. If a record is made before the change of speed, a comparison will show whether the increase is profitable or not.

Another use for a card record of this sort is in comparing such tools as high-speed steel and stellite, in order to find out if the change of tool is warranted by an increase in production. The card record here given shows in the column opposite the various tools the number of pieces which have been machined between each grinding operation. The average is also shown. More than one tool test can be recorded on the same sheet, if desired, and the number of different grinds listed, so that a very good average can easily be obtained. For example, if a lathe tool on a certain job ran for two hours without grinding and required only one minute to set up, it would be seen that the machine could be speeded up or the feed increased until grinding would be required about every hour, when it would be evident that the limit of production had been reached.

Reference to records of this sort could be easily made, the cards being filed and cross-indexed in whatever way may be found most convenient. It is advisable to make the space for remarks as large as the size of the card will permit, in order that a complete record may be kept.

EDITORIALS

Russia Is Retarding the Progress Curve

MANY and conflicting have been the reports from Soviet-Russia. Those from our own correspondent in Riga have given a picture of gloomy conditions in industry. A recent newspaper report on general business conditions as seen by the president of the Amalgamated Clothing Workers of America, stated that Russia is on the eve of vast economic expansion and that there is absolute liberty of speech. A correspondent of the Literary Review of the New York *Evening Post* writes that nothing can be published, except works that express a definite agreement with the policy of the communist party and that there is no literature except the poetry of the "Imaginists." Estimates on the wheat crop show that Russia will have to import instead of having a surplus.

Because of these varied reports we deem the articles by Royal R. Keely, the first of which appears in this issue, to be particularly valuable. Mr. Keely spent a year in studying conditions in Russian industry and another year in prison, because, as he says, he "knew too much."

As he sees conditions, Russian industry is literally paralyzed. The brains of the country are almost wholly devoted to theorizing, accompanied by negligible practice; the Russian workman cannot and will not work; there is nothing for him to eat whether he works or not; and by the existing neglect of schools at least a decade of progress has been lost.

The evidence seems to show that for a long time to come Russia will be an economic drag. With all of her fine natural resources and her vast productive territory she cannot be a real producer for many years. She is handicapped by too much ignorance and too much communism. There remain no rewards for individual accomplishment.

The Industrial Cost Association—An Organization of Practical Men

IT IS in the nature of men to organize themselves into groups for all sorts of purposes, good, bad and indifferent. Some thrive and grow, some merely exist, some soon die out. It is an ancient principle of organizations of men that the individual gets out of them in proportion to what he puts in, from which it might be argued that the association whose members are enthusiastic enough to do the hard work incidental to the preparation of papers and to take active part in the discussions, is likely to be among the thriving class.

Such a body is the Industrial Cost Association whose second conference was briefly described in last week's issue. The membership is not large as yet, but nevertheless most of the papers discussed were written by members. This group of practical men who get together to discuss practical matters and help solve each other's problems, can do much for industry and business and is deserving of wider support.

The Price of Industrial Peace

BOTH Mr. Hoover and Mr. Rowntree, in their addresses before the Academy of Political Science at its recent conference, emphasized the desirability of reaching a condition of economic security for the worker. Such a condition would go a long, long way toward bringing about industrial peace. The scheme of unemployment insurance or its equivalent, referred to by Mr. Rowntree as a constructive measure, is not a new one and it is worthy of wider consideration. That the employer and employee should set aside during prosperity an account for a rainy day seems to offer a simple solution of a very serious problem.

Mr. Rowntree said that to secure industrial peace it will be necessary for the employer to pay the price—commensurate wages, sufficiently short hours, a guaranteed economic security and a proper status of the worker. His conclusions ring true, especially because as the employer of some 7,000 men he has practiced the things he advocates.

We wonder if America has fallen so far short of paying that price. Some figures from the report of the United States Department of Labor on the union scale of wages and hours of labor in effect May 15, 1920, will be enlightening. Wages averaged $48.76 per week in the twenty-one principal trades in the representative city of Chicago. The lowest weekly wage was $37.95 and the highest $55. In eight of the trades the weekly wage was $55. In only three was it below $40. The hours worked per week in these twenty-one trades were 44 in thirteen, 45 in one, 48 in six and 54 in one. These figures would seem to show that the American workman is receiving commensurate wages and sufficiently short hours. We believe that his own evidence will show that his status in society and in the shop is very high and that he doesn't find fault with it. This leaves only the position of economic security for the worker to be attained.

A point that is generally overlooked is that the worker must know that the employer is paying the price. If he once becomes convinced that his wages are a just proportion of the profits of the business, and that shorter hours would be a failure economically, he will be much less inclined to risk his all in a strike. His instruction, of course, implies some very careful work on the part of the employer. Both instructor and pupil would be inclined to proceed warily for a time, but progress would be the more sure therefor. A difficult part of the task would be to overcome the effects of doctrines previously absorbed.

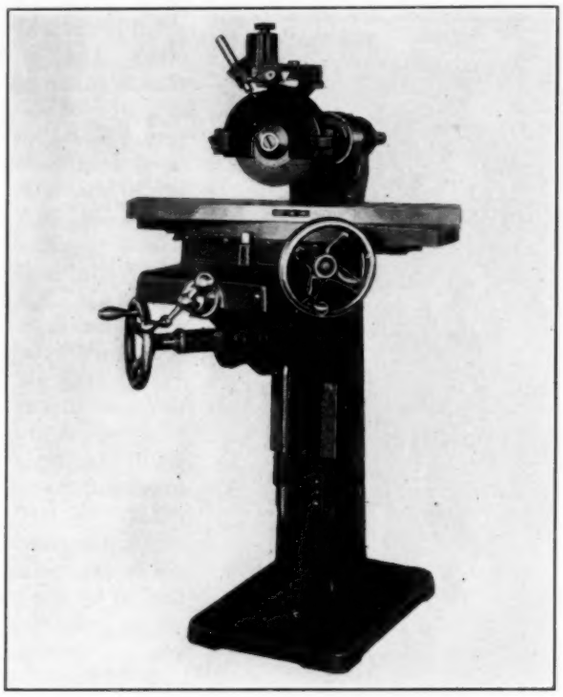
What part can be expected of labor in accomplishing a state of industrial peace? Probably only the indirect one of keeping the employer active. Labor does not possess the broad vision necessary to reach a solution, so the employer and the engineer must consider the problem as their own. The same amount of effort applied toward attaining economic security as is exerted on manufacturing problems would hasten the day of its accomplishment to the benefit of all of us.

Shop Equipment News

Wilmarth & Morman No. 1 Surface-Grinding Machine with Swivel Table

The Wilmarth & Morman Co., Grand Rapids, Mich., has recently fitted its No. 1 surface-grinding machine with an auxiliary swiveling table, as shown in the accompanying illustration. The use of this table adapts the machine to the performing of grinding operations on angular and irregular shapes.

It is not necessary to remove the work from the table and reset it for the angle required; but the auxiliary table can be swung on the sliding table, graduations being provided at one end to facilitate adjustment. The table is provided with T-slots, to accommodate the headstock and tailstock or dividing head. It is not necessary to disturb the work to dress the wheel, as this is accomplished by the built-in wheel-truing device located on the wheelhood. The machine is recommended by the maker for accurate work on gages and dies.

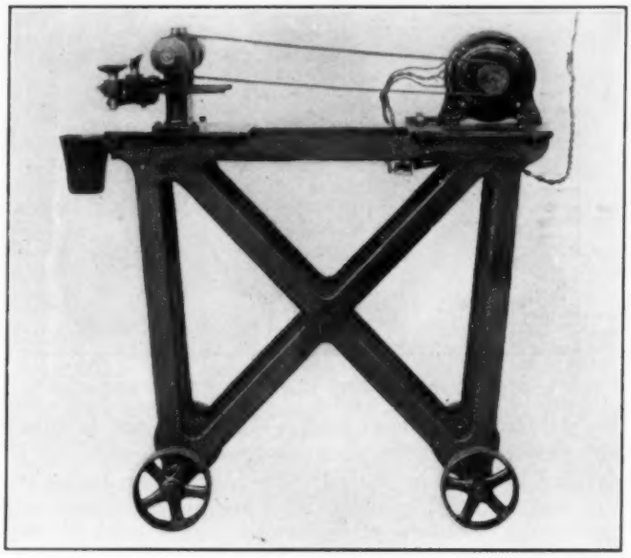


WILMARTH & MORMAN SWIVEL-TABLE GRINDING MACHINE

St. Louis Portable Motor-Driven Grinder

The accompanying illustration shows a type of machine recently developed by the St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo., for grinding tools or implements where it is necessary that the machine be easily portable. The machine consists of a large stand mounted on wheels, so that it can be moved over irregular surfaces without danger of tipping, being particularly adapted to the use of contractors doing outside work, or to yard use.

On one end of the stand is mounted a fully inclosed a.c. motor of the induction type. Either a 3-phase squirrel-cage motor for any given voltage can be furnished, or a single-phase motor capable of operation on either 110 or 220 volts with either 1, 2 or 3-phase current. If desired, a compound-wound d.c. motor can be furnished.



ST. LOUIS PORTABLE MOTOR-DRIVEN GRINDER

The wheelhead is mounted at the other end of the stand, and is belted directly to the motor. The arbor carries two wheels, each of which is provided with an adjustable workrest. A water pot is mounted at the front of the machine.

The machine can be furnished with either No. 1, 2, 3 or 4 "Saint Louis" grinder heads, or No. 0, 1, 2 or 3 "Western" heads. Wheels from 6 to 12 in. in diameter can be carried on the arbors, which vary in size from $\frac{3}{4}$ to $1\frac{7}{16}$ in. in diameter in the bearings of the different machines. The weights vary from 200 to 260 pounds.

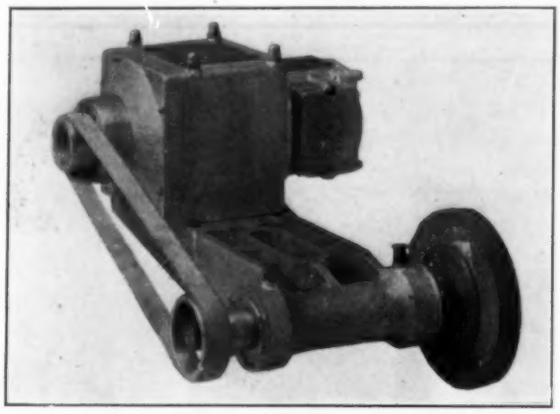
R.V. Portable Electric Grinder

The illustration shows a portable, electric, precision grinder for general use either on a machine tool or held in a vise. It is known as the R.V., and has recently been placed on the market by Arva Stroud, 327 Broadway, New York, N. Y. The machine is made in two sizes, the Type A having a $\frac{1}{2}$-hp. motor, and the Type B a 1-hp. motor. The latter type, having a motor housing of square section, is shown, the smaller machine having a cylindrical motor housing.

The motors used in both types of machine are of the commutator type and operate on either direct or alternating current, being supplied for either 110 or 220 volts. The motor runs at high speed, and is provided with belt drive on two-step pulleys, so as to give spindle speeds of 4,000 and 12,000 r.p.m. under load. The low speed is used for external and the high speed for internal work, spindle extensions being provided for doing the latter work.

The motor is sturdily constructed to withstand the high speed, and the armature is accurately balanced.

The commutator has 32 segments, insulated with mica. The brushes are easily accessible for inspection and renewal. The frame and motor housing are made of a hard aluminum alloy. At the front end of the frame



R.V. PORTABLE ELECTRIC GRINDER

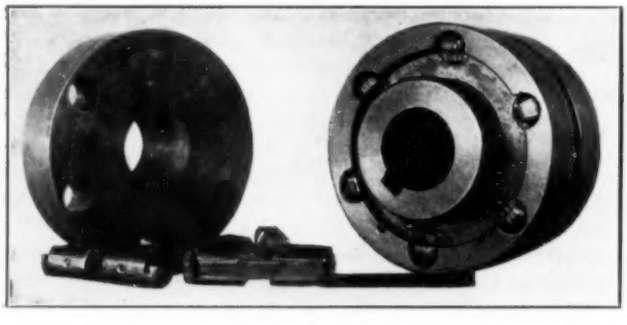
the grinding spindle is held, while the motor is adjustably mounted on the rear, so that the tension of the driving belt can be varied. The device can be secured to a machine tool by means of a bolt through the slot in the center of the frame, as when mounting on the toolpost of a lathe. It can be held in a vise on a machine table, as for sharpening a milling cutter in place.

The grinding spindle runs on ball bearings. The sleeves and extensions are fastened to it by means of taper fits and a square thread. The machine is equipped with two 5-in. grinding wheels with sleeves and flanges, two spindles and wheels for internal grinding, two belts, an adjustable table for hand grinding, two wrenches, and an electric cord with attachment sockets, all fitted into a wooden case. It weighs 22 lb. net and 37 lb. with the accessories.

Francke Light-Duty Flexible Coupling

Smith & Serrell, Central Ave. at Halsey St., Newark, N. J., have recently placed on the market a light-duty type of the Francke flexible coupling previously described in the *American Machinist* on page 836, Vol. 38. The coupling is intended for use on motor drives up to 50 or 75 hp., and for general use about machinery plants.

It consists of two cast-iron flanges reamed to either the same or to different sizes, and mounted on the shafts to be connected. Both parallel and angular misalignment is corrected by the spring pins connecting the two flanges. At the left of the accompanying illustration can be seen one of the flanges, and also the type of flexible pins employed. As shown on the right, six pins are used in the assembled coupling.



FRANCKE LIGHT-DUTY FLEXIBLE COUPLING

Each pin unit consists of a bundle of thin, flat, steel springs held in keepers at each end. A small pin passing through slots in the springs holds the springs in position in each keeper, but allows movement both lengthwise in the pin and at an angle to it. The keepers do not slide in the flanges, but are locked in position and prevented from turning by means of retainer rings. The springs transmit the driving torque and cushion the shocks that occur, the leaves being so placed that they bend slightly as the load is applied.

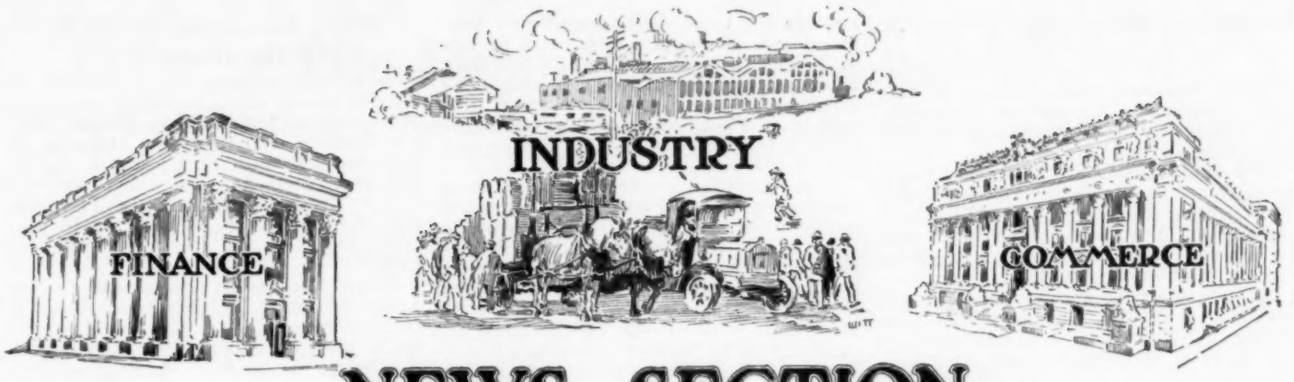
The coupling is furnished in eight sizes for bores from $\frac{5}{8}$ to $3\frac{1}{2}$ in. in diameter, the bores being furnished in $\frac{1}{16}$-in. steps. The smallest size of coupling is $3\frac{1}{4}$ in. in diameter, and can be run at a maximum speed of 2,500 r.p.m., while the largest size, which is $8\frac{3}{4}$ in. in diameter, has a maximum speed of 1,750 r.p.m. The weights vary from 5 to 70 pounds.

Black & Decker "Safety" Cleaning Machine

The device shown in the accompanying illustration has recently been placed on the market by the Black & Decker Manufacturing Co., Baltimore, Md., for the purpose of cleaning small parts with gasoline. The "Safety" cleaning machine consists of a cast-iron pedestal with a bowl at the top, 13 in. in diameter and about 12 in. deep. About 5 in. from the bottom of the bowl, a fine-mesh screen is supported. A plunger pump is cast integral with the bowl at one side. The bowl is provided with a safety cover, arranged so that it cannot be left open when the device is not in use, being controlled by the handle which operates the plunger pump.

BLACK & DECKER CLEANING MACHINE

A gallon of gasoline, kerosene or such liquid cleanser is merely poured into the bowl of the machine, and the operation of the plunger pump forces a stream of this fluid from one side into the center of the bowl. It passes through the screen and returns to the pump, so that the liquid is used over and over. It is merely necessary to hold the part to be cleaned under the stream of liquid, which washes dirt, chips and foreign matter from it, and deposits them on the screen. The machine is particularly adapted to cleaning such small parts as ball and roller bearings, gears, magnetos, drills, milling cutters and tools. It is said to have the approval of the Fire Underwriters, and to be intended to replace the dangerous and wasteful "bucket and brush" method of cleaning.



NEWS SECTION

Organization of Deutsche Werke

Under the above title (German Works) a stock company was formed a year or so ago for the purpose of taking charge and remodeling the former Imperial State Factories in which material for the army and navy had been manufactured. It has not been an easy task to complete this transformation, especially not in view of the fact that gigantic plants with special machinery had, in many instances, to be transformed to the bottom. It was decided that, as a *conditio sine qua non* for the further carrying on of the business of the various enterprises, the latter had to support themselves and to pay interest for the capital invested.

The company took possession of the following State works: Spandau, gun foundries, shrapnel factories, ammunition works, manufacturing of rifles and artillery laboratory, powder factory: Cassel, ammunition works. Erfurt, rifle factory. Amberg, rifle factory. Ingolstadt, gun foundries and shrapnel factories. Munich, plant for artillery. Dachau, powder factories. Hanau, powder factory. Siegburg, shrapnel and artillery material. Lippstadt, artillery material. Rüstringen, undersea-boats and torpedo factories. Kiel, shipbuilding yards. Friedrichsort, torpedo factories. Plaue, powder and ammunition works. Reichertshofen, powder factories.

The capital of the company consists of 100 million marks in shares and 330 million marks in bonds guaranteed by the State. The entire business is now carried on on a commercial basis. The board of administration includes high government officials, representatives of the public diet, and financial and industrial experts. At the present time the German works give employment to about 40,000 men, and the principal articles now turned out by the various works are: Amberg, machine tools, compressed air tools, machine knives and wrenches; Cassel, repair work on locomotives, freight and passenger cars, automobiles, drilling machines, mechanical toys; Erfurt, pocket pistols, hunting rifles, files and rasps, locomotive repair work, etc.; Ingolstadt, metal wares of every description and wood work; Kiel, freight steamers, fishing boats, motor boats, sailing and motor yachts, lighter and bunker ships, ship machinery, turbines, Diesel motors, ship boilers, etc.; Lippstadt, coal mining machinery, mine cars, tip-carts, etc.; Munich, locomotive repair work, agricultural machinery and implements; Spandau, machine shops, repair work on locomotives, freight and passenger cars.

Army Development of High-Powered Guns

A demonstration of the Army's latest achievements in ordnance was staged at the proving ground at Aberdeen, Md., on Nov. 2 for the benefit of members of the Washington Post of the Society of American Military Engineers. The large delegation from the post was accompanied by mechanical engineers from various of the government departments.

The visitors were impressed with the achievement of the Ordnance Department in improving the 75-mm. gun. The French "75" was used by France, England and Italy throughout the war without improvement over the original model brought out in 1897. The ordnance Department has improved the gun until it has a range of 15,000 yards as compared with 8,000 yards, the range of the French gun. Other improvements allow greatly increased elevation and greater ease of manipulation.

It was pointed out to the visitors that while the development of new ideas in ordnance is important function at the proving ground, the real task is the testing of all guns and ammunition made for Army use. Every gun turned out must be tested so as to withstand strains 15 per cent in excess of those of actual service.

Demonstrations also were had of guns on automotive mounts and of the large guns mounted on railway trucks. Numerous improvements have been made since the war in the mounts and in the trucks, since it has been definitely decided to rely largely on this type of artillery for future coast defense.

Aircraft Accidents

A report prepared for the Secretary of Commerce by the information department of the Manufacturers' Aircraft Association states that, based upon the most trustworthy available information, it is estimated that 1,200 aircraft are engaged in commercial flying in the United States today. A conservative estimate places the mileage flown by these craft during the period of January 1 to June 30, 1921, at 3,250,000 miles.

In the first six months of 1921 there were 40 serious accidents in civil flying, not including accidents to government-owned machines, resulting in death of 14 persons and injury, more or less serious, to 52. In 18 instances there were no casualties. The 14 lives were lost in 10 accidents, and injury to the 52 was caused in 20 accidents.

Westinghouse Biography

"The Life of George Westinghouse," by Col. Henry G. Prout, will soon be published by the American Society of Mechanical Engineers for the following committee: Charles A. Perry, chairman; Paul D. Cravath, Alexander C. Humphreys, James H. McGraw, H. G. Prout, Charles F. Scott, L. B. Stillwell, Ambrose Swasey, H. H. Westinghouse.

"To the memory of few other men, if any, do the engineers of America owe so great a debt of gratitude as to that of George Westinghouse, whose inventions and achievements have not only benefited mankind, but have made possible the enterprises in which so many of our members are now engaged," said Calvin W. Rice, secretary of the society, in a statement explaining that "the underlying motive for publishing a biographic series of great American engineers is to inspire others."

British Fairs To Cover Wide Scope

The Third British Industries Fair will be held in Birmingham and London simultaneously during the period from Feb. 27 to March 10, 1922, the Department of Commerce announced today, upon receipt of reports from the American vice consul at Birmingham. The following lines will be represented at the exhibit:

Hardware, metals, engineering trades, power, lighting and heating, brass foundry and ironmongery, engineering in general, agricultural implements and appliances, mining colliery and quarries, brewing, distilling and catering, building and decorating, motors, guns, saddlery and harness and fishing tackle.

Catalogs outlining the scope of the Welsh National Exhibition, to be held at Cardiff, Wales, during the period from May to October, 1922, already have been published, the department declared. The exhibits will include mechanical engineering, electricity, gas-oil, mines and metallurgy, transportation, civil engineering, shipbuilding, motors, aviation, manufactures and varied industries.

Patent Office Salaries

Early consideration of the bill providing for increases in salaries and certain reorganization in the Patent Office is assured. A majority of the Committee on Rules is understood to have agreed to vote for a special rule which will bring that bill before the House for a final vote.

Industrial Situation of Spain

(By Our Spanish Correspondent)

Spain has just been through a terrible convulsion that almost made her lose balance and undermine the foundation of her social structure.

The fabulous profits so easily made by the manufacturers during the World War, filling orders for the Allies and especially for France, made labor ask for higher wages on several occasions, each request being granted.

After some time the workers did not ask, but demanded, increases in wages, giving birth to the syndicalism that has been a constant menace to social organization.

With the termination of the war, orders were canceled, and the manufacturer found himself facing a situation of great expenditure, which he could have easily stood when he was obtaining great profits and his products were being sold at very high prices to the nations at war. But not to-day, when the very little work in hand is done at much lower prices.

This has been the cause of the great industrial crisis through which Spain is passing to-day, made more serious by the fact that the consumer is not buying, knowing that many of the shops are badly equipped with antiquated machinery and that the products are improperly and expensively made. The latter is caused by the reluctance of the manufacturer to lower the prices which he had obtained for his wares during the special situation created by the war.

Germany has taken advantage of these circumstances by sending a great quantity of merchandise into Spain, which finds ready sale on account of the very low prices at which it is sold. Cases are known where steam engines manufactured in Germany have been sold at prices lower than the value of the material of which they were made.

The flooding of the Spanish market with German goods reached to such an enormous proportion that the industrial interests were alarmed and requested the government to take the proper steps to stop the importation of German merchandise into Spain.

In May the government increased, temporarily, all custom duties 100 per cent, and as if this were not enough, in July a new tax of a high percentage was added to the 100 per cent increase already established. This new tax varies according to the quality of the article imported, and the percentage is applied to the currency of the country of origin, at the exchange on the day the custom duties are paid. In this way all merchandise (German, for example), besides paying a double custom duty, must pay the percentage which results from the difference in the currency of the two countries, which is between 86 and 90. Thus a machine of German make pays 40 pesetas in gold for 100 kilos, plus 70 per cent of 86 to 90 for each 100 pesetas, according to the rate of exchange of the day in which payment is made. German exchange being at a discount of 90, 70 per cent × 90 or 63 per cent would be added to the 40 pesetas, making it 65 pesetas. The original rate was 20 pesetas.

By means of this new tariff arrangement the imports from Germany were curtailed, no doubt benefiting the national production, although to a slight extent, since a number of industries require for their development raw material and elements which must be acquired in foreign countries. In this class are the metallurgical and construction industries, which must import the machinery from other countries, principally the United States and Germany.

The Spanish industry is to-day in a very peculiar situation; it is not in a condition to compete with foreign products which threaten to ruin the national production. The only solution the government seems to have found to the problem consists in placing a barrier that hinders the interchange of products with foreign nations. Many believe that it would have been better if the government had protected the industries until they were able to compete with similar foreign producers.

Equipment Used in the Machine Shops

As it has been said, the majority of the Spanish machine shops are badly equipped. The most accepted machinery, due to its economical cost, is the Germany machinery. However, although very cheap, it lacks precision.

The manufacturer in general equips his shops to produce, disregarding the quality of the product. Partly he is right, since very precise work is not especially necessary in this country and consequently is poorly paid. The aim when buying manufactured products is to get them cheap, with no question as to how well they are made.

In this country American machinery is considered the best, and in spite of its high price, to which must be added the great difference in exchange, it is used in a good number of machine shops, most of them of great importance. The import duty would be less than on machinery from countries with depreciated exchange.

American machinery is used in every shop where quality as well as quantity production is required. In general, in the government and in the railroad machine shops only American machinery is used, since it is considered superior to that manufactured in other countries.

Idle Freight Cars Gradually Decreasing

The number of freight cars, idle because of business conditions, totaled 375,370 on Oct. 1, compared with 414,698 on Sept. 23—or a reduction of 39,328, according to reports just received by the Car Service Division from the railroads of the United States. Of the total, 172,420 were freight cars in good condition which could be placed in immediate service if traffic conditions demanded, while 202,950 were in need of repairs.

Reports showed that the number of surplus cars in serviceable condition on Oct. 1 was a reduction of 28,733 compared with the total of the previous date. Surplus box cars in good order numbered 42,093 or a reduction within that period of 13,756; while surplus coal cars totaled 98,048, or a reduction of 12,328 compared with the same previous date. There was also a reduction of 873 in the number of surplus stock cars.

Of the 2,306,036 freight cars on line on Oct. 1, reports showed 364,372 or 15.8 per cent, to be in need of repairs compared with 374,431 or 16.3 per cent on Sept. 15.

Metal Industries of South Show Big Improvement

A steady increase in production at the foundries, machine shops, and iron and steel plants in the southeast during October, especially in Alabama, is reported by William E. Dunn, Jr., of Atlanta, secretary of the Southern Metal Trades Association. The outlook for the future is such as to portend normalcy by the early part of 1922.

Since the recent reductions in the prices of steel rails, production has materially speeded up at the various steel mills, one order being reported by the Tennessee Coal, Iron & Railroad Co. from the Southern Pacific for 44,600 tons of rails for 1922 delivery. It is also reported, unofficially, that the steel corporation plans the establishment of another big industrial plant at Ensley, Ala. Production at the plant of the Chickasaw Shipbuilding & Car Co., at Fairfield, Ala., has increased to twelve or fifteen cars per day.

During the latter part of October the wire mill of the Gulf States Steel Co., at Gadsden, Ala., established a new record in wire production for a single day, producing 737,990 lb. in eight hours, or upwards of 368 tons. The previous daily record was 595,000 lb. in ten hours, or 287 tons. During October the nail mill of the company established a new record, producing 93,000 kegs. The previous best monthly record was 77,000 kegs. With the exception of the blast furnace all departments of the big plant are operating.

Pipe making shops at Anniston, Ala., the largest producer of pipe in the world, are nearly all in steady operation, many of them running at full capacity.

Iron mines in the vicinity of Cedartown, Ga., are in operation again for the first time in many months, shipping the ore to the furnaces at Rock Run.

A new and larger plant will be constructed at Anniston, Ala., by the National Forge Co., to replace the plant recently destroyed by fire. Construction work will begin at once.

A large new foundry and machine shop is to be constructed in the near future at La Grange, Ga., by the J. T. Tice Co. The building will be 175 by 75 ft., and ready for operations by Jan. 1.

SMTA Standards

Gus F. Meehan, of Chattanooga, Tenn., president of the Southern Metal Trades Association, has named the following members of the research committee recently established by the association to set a certain high standard on the products of the foundries and machine shops in the South that are members of this body, and only products measuring up to these standards will be allowed to use the trade name that has been adopted: James R. Hedges, of the Casey-Hedges Co., of Chattanooga, chairman; John S. Schofield, of the Schofield Iron Works, of Macon, Ga.; T. H. Siddall, of the Sumter Machine Co., of Sumter, S. C.; W. W. Storm, of the Wilmington Iron Works, of Wilmington, N. C. All of the members of the committee are recognized as leaders in the metal trades industries of the South, and all are expert metallurgists. The association has adopted an emblem for its products which is known as the SMTA Standard.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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Last week was unusual in that it included two legal holidays and the initial session of the Congress for the reduction of armament of which so much is hoped.

With the convening of this Congress the enthusiasm of the people here and abroad for some agreement that will be a guarantee of peace has become so evident and is so fervently expressed that it is possible that the power of public opinion will compel a millenial meeting of minds between the great nations that are represented at Washington.

If so the effect upon commercial and financial sentiment will be electrical, but it is well not to take too much for granted for "when self the wavering balance shakes it's rarely right adjusted," and it is almost too much to hope that the flare of idealism now apparent will entirely obliterate the racial and national antagonisms that have made Europe an armed camp since the days of the Caesars. This I say because I fear the reaction that would follow if the Conference shall fail in what has now come to be so confidently expected of it.

The tax bill agreed upon by the Senate and the election are the only other political facts in the weeks record that have any direct bearing upon business. Disappointment over the former is possibly responsible for the defeat of the Republican nominees in not a few localities and the effect will be salutary if the House shall be made more considerate of business when it comes to deal with the Senate proposals. In the "Congressional Record" Senator Frelinghuysen is quoted as saying: "I believe this is a political taxation bill, not a scientific taxation bill, and I believe that the burden which it imposes upon business is so great that it means a continuation of business paralysis."

Most men of affairs agree with him, for the only relief that the Senate bill provides is the elimination of the excess profits tax and a graduated reduction in the surtax which leaves the maximum at 50 per cent. The details of the bill are fully set forth in the newspapers and need not be further discussed here.

One gratifying feature of the election returns is the general reduction in the Socialist vote. Last year the New York Assembly contained four Socialists but none was elected this year.

In the security markets the area of buoyancy is extending itself in accordance with precedent. The boom in bonds which has advanced Liberty Bonds still further and made it possible to sell high-grade industrial and railroad bonds on a 6 per cent basis has induced some buying of the preferred and common stocks whose dividends are assured. Unless history shall fail to repeat itself it is only a question of time when the low-priced securities will join in the upward movement, for in the past it has always been true that when loans could be easily and cheaply obtained people would borrow and buy.

That we are entering upon a period of easy money seems to be indubitably indicated by the Federal Reserve statement. The reserve ratio is 71.4 per cent as against 71 per cent at the end of the previous week and the gold reserves have gained another $16,000,000. The gold held by the banks now exceeds the $2,500,000,000 of Federal Reserve notes and bank notes outstanding by $316,000,000 and in these circumstances cheaper money seems to be inevitable. The fact that new bond issues aggregating over $20,000,000 on several days have been absorbed without causing even a ripple in the money market is conclusive evidence of a plethora of investment capital that will sooner or later find speculative employment.

In the commodity markets the sensation of the week has been a sharp drop in the price of cotton following the issuance of a ginning report which showed that the government's earlier crop estimate of 6,537,000 bales is likely to be largely exceeded. But even if this season's crop shall reach 8,000,000 bales, as some now expect, the supply at the end of the season will not be excessive and the decline in prices will probably give impetus to the movement for crop diversification in the South and a still further reduction in cotton acreage next year.

Meantime, with wheat bringing only 75 or 80 cents on the farm while corn is being used for fuel because it cannot be sold and hogs, cattle and cotton selling at less than the cost of production, the farmer's predicament is one that calls for the attention of thoughtful men everywhere.

In the cities there are numberless organizations whose purpose it is to make urban and industrial life more attractive. A hotel boot-black now makes more money and lives with less toil and in greater comfort than the man who owns and cultivates 160 acres of land. Unless some way is speedily found to correct this inequality agriculture will become a lost art for it will be abandoned to the ignorant and unenterprising residuum of the population who haven't the wit or the energy to detach themselves from the land.

I proffer these observations in lieu of my usual review of the commercial movements of the week which have not been otherwise important. Generalizing, it may be said that distributive trade is now normal. A remarkable increase in building operations is noted in nearly all the commercial reports. There is a striking decrease in the number of unemployed and business men throughout the country seem to be more cheerful than at any time this year.

If it were not for the threatened agricultural depression it would be unnecessary to qualify one's optimism and it is to be hoped that some way may soon be found to make the farmer a participant in the prosperity which those who live in the cities enjoy.

The news from overseas has but little of novelty in it. Lloyd George is still struggling with the Irish problem but the indications are that he will solve it. The unrest in India seems to be spreading and silver is lower. British trade is nevertheless improving. The London discount rate is down to 3½ and there seems to be a plethora of loanable capital there as well as here.

German marks are still lower. "Three for a cent" was the price in New York last Wednesday. They subsequently advanced to 40 cents per 100 but their fluctuations have ceased to have any significance except as the bankruptcy of the German government is indicated. Sterling exchange is distinctly firmer and if a substantial reduction in armament is agreed to at Washington it will probably advance still further for in Europe as here the economic future is largely dependent upon the action taken at the most momentous gathering held since the armistice was signed on Nov. 11, 1918.

Tests of Manila Rope

The Bureau of Standards has recently issued Technologic Paper No. 198 on the tests made on manila rope. It is ready for distribution by the Superintendent of Documents, Government Printing Office, Washington, D. C.

The results of the tests discussed in this paper represent some of the data which have been accumulated at the Bureau during the past few years. Most of the specimens were submitted by various rope manufacturers on purchase orders for government departments and a fixed procedure was adopted by the laboratory in testing all of them. The rope ranged in diameter from ½ to 4½ in. inclusive, and consisted of commercial 3-strand, regular lay ropes. The breaking load, weight per linear foot, number of yarns, and the lay of the rope and strands, as well as the elongation, were measured. The average breaking load was found to be approximately a quadratic function of the diameter of the rope. It is expressed quite closely by the equation

$$L = cd(d + 1)$$

in which L is the load in pounds, c is a constant equal to 5,000, and d is the diameter of the rope in inches. The ropes showed a continually varying modulus of elasticity and no well-defined proportional limit. The number of yarns composing a rope may be expressed approximately by the equation

$$N = kd(d + 0.4)$$

where N = the number of yarns, k is a constant equal to 50, and d the diameter of the rope in inches.

The test results cover sufficient range and show such consistency that it is believed that the formulas deduced may be safely used for 3-strand regular lay manila rope of sizes between ½ and 4½ in. in diameter.

Industrial Ills and Their Remedies

Opinions and Advice of Experts on Various Phases of Industrial Management—Better Co-operation Urged—Hoover, Rowntree and Others on Labor Conditions

At the annual convention of the Industrial Relations Association of America, held on Nov. 1, 2, 3 and 4 in New York city, the subjects covered at the open meetings and sectional conferences covered a wide and varied field of industrial subjects. Employment and personnel work received a good share of attention, as did departmental costs, living costs and wages.

It would be impossible for us to cover the entire meeting in a limited space, so we have selected a few of the addresses which we believe have a more intimate relation to our readers. Brief digests of these are presented herewith.

Problems of industrial relations was the subject at the session on Wednesday. S. R. Rectanus, director of employment of the American Rolling Mills Co., spoke on "Sound Employment Practices." Mr. Rectanus said that the greatest and only law governing employment is the Golden Rule—its application in a humanitarian way. He described the practice of co-operative committees as employed at the American Rolling Mills, taking up the organization of workers, community and stockholders, and their share in the settlement of industrial problems. He advocated the filling of higher positions in a firm by promotion of efficient and worthy employees, but admitted that the fresh viewpoint of an outsider was often beneficial to a concern.

Oppression Its Own Enemy

In closing his remarks he said: "Through specialization and realization that manpower is the most important factor in industry, our factories are better than ever before, and any form of oppression or economic condition has in it the seeds of its own destruction, and only those who adapt themselves to changing conditions will survive and develop."

Earl B. Morgan, of the Curtis Publishing Co., led a discussion on the costs of an industrial relations department. He said that the cost of personnel work was entirely up to the management of a concern. He advocated the use of charts in personnel work, classifying the activities and charging the expense of each to its proper account. Thus an efficient and up-to-date record can be at hand for any reference or for learning the personnel costs at a glance. He urged a budget system for personnel managers, basing the expenditures for the various activities on the number of employees, working conditions, community life and other conditions peculiar to the business.

Determination of Wage Rates

On Thursday morning a most interesting study of the relations between living costs and basic wage levels and wage changes was presented by Magnus W. Alexander, managing director of the National Industrial Conference Board.

Mr. Alexander drove his points home by the use of charts which were prominently displayed about the room. He started his discussion with an analysis of the family budget, showing the cost of keeping an average household under present living costs and wages. He divided the budget as follows: Food, 43.1 per cent; clothing, 13.2 per cent; shelter, 17.7 per cent; fuel and light, 5.6 per cent, and sundries, 20.4 per cent.

He also presented a chart showing the percentage increase in the cost of living since 1914. From that time to the peak of high prices in July, 1920, he showed an advance to over 200 per cent, while at the present time this rise has gone down to about 63 per cent. Another interesting chart showed the purchasing power of the dollar from 1914 to the present. Taking 1914 as full value, the dollar is now worth 61 cents—in purchasing value. He declared that it is not the monetary wage but the purchasing power of that wage, that effects our economic condition; his figures showed that workers who have full time employment today are 20 per cent better off than they were in 1914.

The Golden Rule

In the afternoon the convention listened to a discussion of the fundamental principles of human relations in industry by Loyall A. Osborne, president of the Westinghouse International Electric Co. Mr. Osborne divided industrial relations into two categories, economical and ethical, and analyzed these according to his own viewpoint. He made a plea for cordial relations between employer and employee, saying that on no other basis could industry thrive. On the subject of wages he stated as his opinion that wages should be based on production—the ability to produce determining the rate of pay, and not membership in any organization. He branded the closed shop as contrary to American institutions. Wages should not go back to the level of 1914, he said, but should be gradually adjusted with the decline in living costs. He warned against industrial education schemes which make factories the schoolhouses of propaganda.

He closed with the statement that the one fundamental principle of human relations in industry was a generous interpretation and application of the Golden Rule.

Joint Meeting

The joint meeting of the Academy of Political Science and the Industrial Relations Association of America was opened at the Hotel Astor on the morning of Nov. 4. After an introduction by the president of the Academy the meeting was turned over to Sam A. Lewisohn, who presided at the morning session. In his opening remarks Mr. Lewisohn pointed out that while some questioned the relation between political science and industrial relations in reality industrial relations are the politics of industry. Or to raise it to a still higher plane, where it properly belongs, industrial relations should be considered the statesmanship of industry. In opening this conference, devoted to constructive experiments in industrial co-operation between employers and employees, Mr. Lewisohn pointed out the necessity of continuous co-operation and confidence as being necessary to the harmonious conduct of any business. While arbitration is highly desirable when it becomes necessary, it can only act after the disturbing facts have become realities, when in reality the questions at stake should never reach the arbitration stage if it is possible to avoid it.

He pointed out the vital need of proper employment management, or personnel work, as it has come to be called in many cases, and emphasized its importance. He urged employers to consider that it must not be thought of as a side issue to be delegated to some one who could keep peace in the industrial family, but that the employer himself should give as much time and personal attention to questions of personnel and morale as he did to business and mechanics.

Lead—Not Drive

He pointed out the desirability of settling so far as possible all questions within the plant, and gave as his belief that where proper relations were maintained there was very little need for a union among the workers. This, however, varies with the nature of the industry, and in such cases as the building trades, where continuous employment with the same employer is almost out of the question, a strong union of the employees became necessary for their own protection. According to his statistics, from 10 to 25 per cent of industrial employers in this country use advance methods in handling personnel problems. This showed a great need of education among employers, as well as employees, and he expressed the belief that courses in industrial relations must soon become a part of the curriculum in our colleges. Summing up, he stated that the understanding of the human element in industry was the acid test of management, and he quoted the slogan, "Let Employers Lead and Not Drive."

Charles B. Seger, chairman of the board of directors of the United States Rubber Co., spoke on "Employee Representation and Personnel Work in a Large Scale Organization With Many Plants." Mr. Seger has devoted a large portion of his time to this work, and is thoroughly convinced that the solution of the problem of harmonious relations is in establishing complete confidence between the men and the management. This can only come from knowledge and understanding, based on truth and honesty of purpose. Each side must know the other as thoroughly as possible. Where the organization is so large that it becomes physically impossible to know each man personally, it becomes necessary to choose the representatives of the executives with extreme care, and to provide channels whereby the worker may secure information and express his opinion on all matters pertaining to industrial management. Shop councils seem to provide the best method for this, and if both sides make the proper effort no outside interference will ever be necessary. The initial step must come from the employer, who must many times undo injustices

of the past and establish confidence by methods which are fair in every particular. Each plant should so far as possible be a unit in securing and maintaining the confidence of its men.

Personnel Work and Co-operation

Under the title, "Executive Leadership and Personnel Work in Public Service Corporations," E. K. Hall, vice-president, American Telephone and Telegraph Co., told of that concern's work in securing co-operation among its 270,000 employees. Among the advantages are that it is not subject to seasonal fluctuations, nor to competition, but its disadvantage is that being a monopoly which is regulated as to profits it can hardly offer profit sharing as an inducement for co-operation. Then, too, its plant and its employees are so widely scattered that a large supervisory force is necessary. One of the great difficulties of this is that of securing enough minor executives to understand the handling of the human element, and it has been found that most of the friction comes from misunderstandings which occur very close to the working force. Being a 24-hour service makes it extremely difficult to get in personal contact with all the employees or to hold general meetings at which all can be present in any one district.

It is Mr. Hall's belief that one of the causes of industrial unrest is the fact that working men and women feel that they have no standing in the industry, but are simply small cogs in a huge machine. One of the compensations which we all enjoy is that of approval for good work done, and when this is overlooked it adds to the feeling of discontent. It is his belief that means must be found for giving workers a feeling that they have a definite place in the industry. In many cases the average man's connection with the industry is too narrow to give him a feeling of being part of the institution.

Working along this line Mr. Hall has endeavored to promote family feeling and to make people want to work together for a common aim. The company prepares organization charts which include everyone in the central station or district, from the manager down to the janitor, making them all feel that they are part of the family. This is in distinct contrast of the usual organization chart which only shows the heads of various departments and leaves all the rest in an unclassified mass. The result of this change was recently expressed by one of the employees of the company about as follows: "I have been working for this company for seven years, but up to a year and a half ago I felt that I was simply a servant of the family. Today I realize that I am a real, honest-to-goodness member and can sit down at the table with the family."

Fair wages, a status in the industry and opportunity to secure stock at a fair price (65,000 of their employees own $15,000,000 worth of stock) and the real desire for harmony, have done much to promote the best of relations in this company. The desire for harmony and real co-operation, however, must come from those at the top and cannot be successfully played up by anyone in the role of Santa Claus. It requires the highest kind of executive leadership to secure continuous co-operation in any industry.

"Stabilizing of Employment in a Diversified Seasonal Industry," by Henry S. Denison, president, Denison Manufacturing Co., was an extremely valuable contribution to the proceedings. Taking his own business as an example, he told how by co-operating with and directing the sales force the company had distributed its output on some eight thousand items quite evenly throughout the year. This required a careful analysis of the different departments and the working out of a plan for both educating and controlling the selling force.

In his opinion, many experiments which have been called failures at the end of a year or two have eventually worked out satisfactorily when sufficient time has elapsed for all parties to readjust themselves to the new conditions. In the same way betterment of any kind should not be "installed," but should grow from small beginnings with the mutual knowledge and help of all concerned. Mass action, except in the case of mobs, is very slow and if an experiment works out in from seven to ten years we should be perfectly satisfied.

The transfer of operators from one department to another has been found advantageous in maintaining a dependable working force. This, of course, requires training on two or more kinds of work, but the cost of this has been found much less than was anticipated and it has resulted in a more flexible working force as well as securing increased loyalty and co-operation. When an employee knows that should work fall off in one department he or she will be transferred instead of being laid off, there is no tendency to make the job last, and there is also a great increase in the feeling of really belonging to the family. Then, too, the worker is relieved of the monotony of continuous repetitive work, so that this plan has advantages of many kinds. Perhaps one of the worst features of the old method of laying people off was that the best workers rarely came back, as they secured jobs elsewhere leaving only the least desirable to answer the call for renewed activity. Here again it was pointed out that management is to be taxed with new problems and that the responsibilities of conducting business have far outgrown anything which our forefathers dreamed.

The Mystery of Business

Unfortunately, Charles R. Hook, vice-president of the American Rolling Mills Co., who was to talk on "Winning the Confidence of Employees by Taking the Mystery Out of Business," was prevented from being present owing to illness in his family. He was, however, ably represented by his personnel director, Mr. Rectanus, who outlined the plans which had been employed by this company since 1904. Advisory committees are elected by secret ballot, the privilege of voting and holding office being confined to employees who have been with the company a year. These committees take up problems of production, working conditions and other matters which affect both the company and the workers. The objects of the company, the way in which it conducts its business, the conditions of the market in general and the economics of business are discussed and made clear so that every man and woman in the plant has, or can have, a clear understanding as to the methods and practices of the company. The questions of investment, surplus, cost and profits are freely discussed, the executives believing that all problems of this kind should be made clear and that there should be no mystery which can harbor distrust and further the belief of exploitation of the workers. In some cases where it is not deemed advisable to make the exact figures public, a small group of workmen who are thoroughly trustworthy have been shown detailed statements before they were given to the directors and stockholders, in order that they might understand the exact conditions, and, without revealing figures, convince the rest of the men that the statements made by the company were absolutely correct. This is simply one of the ways of securing and maintaining confidence, without which real co-operation cannot be secured. It is Mr. Hook's belief that practically all of the mystery which has surrounded business so far as its employees are concerned is not only unnecessary, but is a direct cause of much distrust and misunderstanding.

Unemployment Insurance

Insurance against unemployment in a plant was discussed by Harold A. Hatch of Deering, Milliken & Co., the Dutchess Bleachery and the Abbeville Cotton Mills Co. This plan has been in operation for some time at the Dutchess Bleachery and consists briefly, of setting aside a portion of the earnings of the company for an unemployment insurance fund to be used when necessity arises. The employees also contribute to this fund in some cases. The percentages vary according to conditions, but the companies were fortunate in accumulating a sufficient fund so that the unemployment insurance is still in operation as much as necessary. Under this the employees who are laid off through no fault of their own receive half pay during the periods of unemployment. Mr. Hatch pointed out that this, of course, could not be continued indefinitely but that the plan had been of material help during the present depression.

This subject was also discussed by O. D. Young, treasurer, General Electric Company, and others. Some expressed the fear that a plan of this kind might tend to prevent savings on the part of the employees themselves, and it is quite probable that all cases of this kind must go through a preliminary stage during which we must all be educated to the poorer conditions.

The afternoon session was devoted to "Industry-wide Co-operation," with Samuel McCune Lindsay presiding. Under this heading Matthew Woll, president, International Photo-Engravers Union, and F. A. Silcox, director, Department of Industrial Relations, United Typothetae of America, told of standardization and co-operation in the printing industry. Joint relations in an industry without plants were discussed by Ernest Trigg, vice-president, John Lucas & Company. Co-operation within the clothing industry was presented by Earl D. Howard, chairman, National Board of Labor Managers for the Clothing Industry. L. K. Comstock, president, L. K. Comstock & Company, spoke of joint and national counseling in the electrical construction industry, and the development of co-operation in industrial relations within the leather goods industry was presented by S. K. Prokesch, of Robbins & Prokesch. These cover a wide

range of industries and it is particularly interesting to note that progress has been made in all these lines.

Hoover Analyzes Labor Unrest

The third session was held in conjunction with a dinner meeting of the Academy of Political Science. Herbert Hoover, presiding officer, in pointing out the value of good will and co-operation in industry, gave a brief analysis of labor conditions as they exsit today.

Mr. Hoover referred to the universal desire for the limitation of armament, not only internationally but industrially, stating that warfare is becoming more destructive year by year. He expressed the idea that there is arising in the community the desire for a better basis of settlement of industrial disputes, referring particularly to transportation and coal, fields in which "two per cent of the population may jeopardize the comfort and security of the other ninety-eight per cent."

A Third Party

In referring to altercations between employee and employer he stated, ". . . . their very discussions now send economic shivers through the whole community, even though they have no intent to engage in battle. The public is coming to believe, whether justifiably or not, that in these mobilizations on both sides there may yet be a tendency to come to terms on such a basis as will pass mutual charges on to the public. As a result of these things we have seen the gradual extension of the arm of the public to these disputes through both administrative and legislative action. We also witness this extension of public interest bitterly resented both by the employers and employees. The thing that must concern us all is that the entrance of the third party into these disputes will be in such form that it does not increase the ill will, that it shall be in such form as will secure justice and that will preserve the very foundations of initiative and that type of American individualism upon which our whole social system is based, and that it will recognize the fundamental necessity to build up good will itself."

Unemployment was given as largely responsible for industrial unrest. "One of the causes of ill will that weighs heavily upon the community," said the speaker, "is the whole problem of unemployment. I know of nothing that more filled the mind of the recent conference, while dealing mainly with emergency matters, than the necessity to develop further remedy, first, for the vast calamities of unemployment in the cyclic periods of depression, and, second, some assurance to the individual of reasonable economic security —to remove the fear of total family disaster in the loss of the job.

There Will Be a Remedy

"I am not one who regards these matters as incurable. Thirty years ago our business community considered the cyclic financial panic as inevitable. We know now we have cured it through the Federal Reserve System. The problem requires study. It, like our banking system, requires a solution consonant with American institutions and thought. Many American industries are themsleves finding solutions. There is a solution somewhere and its working out will be the greatest blessing yet given to our economic system, both to the employer and the employee. There is also in this great question of unemployment the problems of seasonal and intermittent industry; some of them are incurable, but some are not, and every one cured is a contribution to the solution of these matters.

"An exhaustive study of these problems on a national scale is being undertaken by the President's Unemployment Conference and this study will be carried on by men active in industry itself.

"In industry as a whole it seems to me that the industrial conference expresses the key to all advance in these relationships. It is idle wholly to deny the existence of conflicting interests between employers and employees. But there are wide areas of activity in which their interests coincide. It is the part of statesmanship to organize identity of interest where it exists in order to reduce the area of conflict."

A British Point of View

B. Seebohm Rowntree, president Rowntree & Company, Ltd., cocoa works, York, England, spoke on "Conditions Essential to Industrial Co-operation from a British Employer's Point of View." He complimented American business men upon the efficiency with which they have handled their material problems, but stated that the same effort is not being exerted on the human problems. He gave three theoretical ways of solving the problem of industrial unrest, with the qualification that the first two will not work: (1) Capital shall grow so strong that labor will not dare to raise its head; (2) capital might federate on the one side and labor federate on the other, each seeking to become so strong that the other would not dare attempt to destroy the balance of power; (3) both sides may seek out the causes of industrial unrest and attempt to remove them. Industrial unrest is a reflection on the ability and intelligence of the employer. To secure industrial peace, he must pay the price, consisting of commensurate wages, sufficiently short hours, a guaranteed economic security to the worker, and possibly a proper share of the profits of the work.

A Living Wage

Commensurate wages he defined as wages that must be paid to the least skilled worker to enable him to marry, live in a decent house, raise a reasonably large family and have enough left over for necessary recreation. His definition of sufficiently short hours was that the worker must have a long enough period away from the factory to enable him to re-create his powers. Industry will in all probability become more mechanical and the tendency will be for work to become more monotonous, so that there enters not only the question of fatigue, but also the question of renewing mental powers.

The third point was considered by the speaker to be of the greatest importance. The worker must have economic security. The sense of insecurity at present existing is like a dark cloud hanging over his head. "If the proper maintenance, of industry," said Mr. Rowntree, "requires a surplus of men why should not industry contribute to the maintenance of that surplus?" His constructive suggestion was that there be a mutual insurance against unemployment, so arranged that the worker contribute each week from his pay and the employer set aside with it a given amount each week. Such an arrangement would be parallel to that now existing to protect stockholders. The plan could be operated by the State or by the industry as a whole or by the individual employer in his own works.

The fourth point, the status of the worker, is becoming more prominent each year. As the worker becomes educated he is more given to wondering why he sould not have some voice in deciding how he should conduct himself in the shop.

Profit Sharing

Mr. Rowntree expressed himself as a little bit uncertain about the fifth point. He stated that he is inclined to believe that if there is anything left over after a fair profit has been made and capital has been paid enough so that new capital will be attracted, then labor is entitled to a share.

His conclusion was that if the employer will pay the amount specified in the five points referred to the goods will be delivered and that there must be introduced into business the spirit of real sympathy so that employees are led and not driven.

Labor's Point of View

Hugh Frayne, general organizer of the American Federation of Labor, spoke on the subject, "From the Worker's Point of View." He admitted that there exists a lack of co-operation and good will and stated that we cannot go on as we have been, as there must be a limit. "I believe we have almost reached that limit now," he said. He expressed his willingness to welcome any movement which will bring together labor and capital to establish a program of mutual satisfaction and production.

James J. Davis, Secretary of Labor, enumerated various sub-divisions of the department's plans. He stated that he is against what is merely the living wage and that he favors a saving wage, explaining that a lesson thoroughly learned by the working man from the war and from experiences after the war is that he must save.

Opponents of Metric Bill To Be Heard

Hearings on Senator Ladd's metric system bill are to be resumed, according to present plans, during the latter part of November. At that time the opponents of the measure will present their side of the case and attempt to refute the arguments made in support of the legislation.

There is reason to believe that there will be opposition to this legislation from within the administration if the bill should advance sufficiently far on its legislative course to call for an expression from that quarter. It is known that the official whose opinion would probably govern in such a situation does not believe it is wise to adopt legislation of this sort at this time. He regards the metric system as an ultimate but rather distant ideal. Before attempting to clamp it down on the Nation as a whole, he thinks time should be allowed for a knowledge of metric weights and measures to percolate more thoroughly. Even then he would be opposed to a general application of the system by compulsory methods. He thinks it could be applied first in a limited way and gradually extended.

Air Mail Service Makes High Record

An almost perfect record of performance is reported by the Air Mail Service during July, August and September. The performance of the entire service was as follows:

"Percentage of performance 98 per cent; number of miles flown with mail 391,018; number of letters advanced 10,014,280. The performance by divisions: New York-Chicago 98.5 per cent; Chicago-Rock Springs 97.6 per cent; Rock Springs-San Francisco 98 per cent.

"In addition to the 391,018 miles flown with mail on regular schedule, the records show 49,662 miles of test flights and ferry trips, making a grand total of 440,680 miles flown in the three months.

"During the quarter, we had eleven crashes. In two accidents the ships were completely destroyed. In eleven cases of damage, eight occurred on our fields and three at points of forced landings.

"During the quarter, there were no fatalities or injury to employees on one regular mail trips. However, there was one fatality on a ferry trip. On July 16, 1921, Pilot Howard Smith lost his life in ship No. 222 on the San Francisco field. He was assigned to ferry this ship to Reno and fell from an altitude of 300 ft. on the home field.

"The cost per mile of operation during this period was: July 73 cents, August 71 cents, September 70 cents. This shows an average of 71⅓ cents per mile during this period. The records show that the cost during the same quarter of the year 1920 was 87 cents per mile.

An exceptionally good record is being made on that portion of the transcontinental route between Cleveland, Ohio, and Chicago, Ill. The air distance is 335 miles. The last date on which a mail trip was defaulted was April 29, 1921. We have completed 24 weeks of 100 per cent performance on this leg of the route and we are now on our twenty-fifth week without a break. During the 24 weeks, the mails were flown 96,480 miles without default.

"A record flight was made by mail planes between Salt Lake City and San Francisco on Friday, Oct. 14. The time consumed from take-off at Salt Lake City (5:32) and arrival at San Francisco (11:33) was six hours and one minute. A stop for service of eleven minutes was made at Elko and a twenty-minute service stop was made at Reno; therefore, the actual flying time was five hours and thirty minutes.

"Train No. 9, the fast exclusive mail and express train operated over the Southern Pacific Railroad has a schedule of 24 hours and 15 minutes between Salt Lake City and San Francisco.

Details as to the accidents are shown by the following:

Date	Location	Cause	Damage
July 2	Honey Creek, Iowa..	Anemometer pump failed.....	Propeller damaged.
July 11	San Francisco, Cal..	Skid landing.....	Propeller and radiator.
July 13	Elko, Nev.....	Pancake landing.....	Damaged landing gear.
July 13	Cheyenne, Wyo.....	Wind blew ship over on ground	Propeller, radiator and other slight damage.
July 15	Rock Springs, Wyo.	Hit light and dead air.....	Propeller, radiator, wings and landing gear.
July 15	Washington, N. J...	Forced down in storm.....	Broke longerons.
July 16	San Francisco, Cal..	Unable to pull out tail spin. ...	Ship totally destroyed.
July 20	Bellefonte, Pa.....	Pancake landing.....	Broke bottom longerons.
July 27	Chicago, Ill.....	Broke wheel in landing.....	Propeller, radiator, lower wing panels.
Aug. 4	Concord, Cal.....	Out of gas.....	Broke longerons, damaged wing and landing gear.
Aug. 6	Elko, Nev.....	Overshot field.....	Ship entirely destroyed.

Eleven cases of damage, eight occurred on or around fields and only three cases of damage at points of forced landings.

Cushing's Survey of Coal Situation

After personal visits to a number of coal consuming centers, and a telegraphic survey of the situation among wholesalers, George H. Cushing, managing director of the American Wholesale Coal Association, has reached the following conclusions:

(1) The stocks of high-priced goods of all kinds have about been worked off. Manufacturers everywhere are buying raw material only after they have orders for the finished product, manufacturing the raw material into a finished product as quickly as possible and are making shipments almost instantly. Everywhere there is a definite feeling that price liquidation has reached bottom on the present wage scale. Everywhere there is a feeling that business activity is starting to resume and there is an expectation of a price recovery.

(2) That stocks of coal in the hands of retail dealers are equal to November demands for at least two weeks and range in some places as high as three weeks. Almost uniformly public utilities have on hand a thirty-day supply of coal. The householders have taken coal into their own bins to the extent of between 30 and 40 per cent of their winter's requirements. Stocks on hand by industrial plants range from practically nothing at all up to a supply equal to 100 days.

(3) There was no general belief that the railroad strike would occur. There was a little precautionary buying but not much. In one or two places there were slight prices advances. Generally the market was dull.

(4) In Ohio and western West Virginia and eastern Kentucky there is already a shortage of cars. It is rather surprising to see that railroad movings have been for three weeks on the basis of 95,000 cars per week which is about equal to the average of 1918, and is getting close up to what heretofore might be considered prosperous times.

Kempsmith Co. Makes Film of Milling Machine at Work

Under the supervision of Sumter Calvert, manager of the industrial department of the Society for Visual Education, a moving picture has been taken of a Kempsmith milling machine, manufactured by the Kempsmith Manufacturing Co., Milwaukee, Wis. The film shows the unit assembly of the machine and brings out the accurate building of its component parts. A machine in operation was also photographed, giving close-up views of the cutters and the removing of chips. Another film shows the operation of cutting a gear, bringing out the manner in which a tooth is cut.

The pictures will be used in vocational education work.

America Must Wake Up To Possibilities of Foreign Trade

The following paragraphs are taken from an address by Dr. Frederick Willson, of Reading, Pa., before the Industrial Relations Conference under the auspices of the Pennsylvania State Department of Labor, held at Harrisburg on Oct. 24 to 27:

There was a day when the American business man thought the best way to manage his affairs was to stick closely to his desk at all times and to write a complaining letter to his Congressman once in a while when things did not seem to be going well. However, changed conditions induce new activities and so of late we are finding it advantageous to leave our desks occasionally and visit other countries. The reason for this change of attitude is not far to seek. During the late war, all industries in the United States were stimulated to larger production through increase in their physical equipment and now that the war is over, many factories find they must develop an export outlet for 25 to 35 per cent of their production if plants are to be operated on a profitable basis. It becomes highly important for us to ascertain, therefore, whether it is possible now, or in the near future, to find an export market for our products, while along with this question, and overshadowing it, is the doubt as to the ability of American manufacturers to continue even to hold their domestic market against foreign invasion.

A Vital Question

With idle factories and millions of workmen deprived of the means of livelihood, these questions are of vital importance. So involved are the fundamental conditions underlying business in these days that it becomes the imperative duty of the live executive to get under the surface of things and to do a little thinking for himself.

The group of nations that were neutral during the war, including Norway, Sweden, Denmark, Holland and Spain, are undoubtedly in better shape in many particulars than the belligerent countries, but they too have their troubles at the present time because of greatly increased commodity prices, a tremendous advance in labor cost, and all the other evils which accompany development of trade and industry under the forced and unnatural conditions induced by the war. Seafaring countries like Denmark and Holland were particularly affected this year by the decrease in shipping. While in Copenhagen I saw literally hundreds of large ocean-going steamers lying at anchor, the condition at that time being more than unusually acute owing to the protracted coal strike in Great Britain.

Industrial conditions in Belgium are very much depressed, owing to lowered consumption at home and inability to meet foreign competition. Belgian Trade Unions reported in February of this year that 22 7/10 per cent of their membership of 621,000 were unemployed; the textile trades, as in France suffering very heavily.

The impression a stranger gets in Great Britain is that there is a woeful lack of mutual confidence and understanding between Capital and Labor, with the unfortunate result that instead of all interests getting together for the common good there is a tendency to lean upon trade organizations formed for purpose of conflict rather than to promote industrial peace. Under such

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Grinding Stand, Tool

Frontier Machine Tool Co., Inc., 128 Lakeview Ave., Buffalo, N. Y.

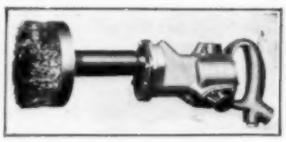
"American Machinist," June 9, 1921.

The machine is of the ordinary wheel-stand type, is belt-driven and carries two wheels. Guards are furnished for the wheels, and rests for the work. A countershaft can be furnished. The wheels are 12 x 2 in. in size and 15 in. apart. The height of the center of the spindle is 39 in. and the floor space required is 18 x 24 in. The machine without the countershaft weighs 195 lb. net, and 215 lb. crated. The countershaft has a length of 24 in., a drop of 7 in., and weighs 58 lb.

Brush, Wire, for "Little David" Air Drill

Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

"American Machinist," June 9, 1921.

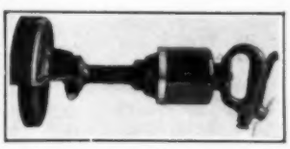


The brush is for use with the standard No. 6 "Little David" pneumatic drill, on which it is shown. It has a face diameter of 5 in. and is made of wires of heat-treated steel. It is said to be sturdily constructed, so that it will stand up under severe service. The wire-brush outfit is adapted to the removal of paint, rust, scale and dirt from tanks, steel cars, structural and sheet-metal surfaces, as well as to cleaning iron, steel and aluminum castings. The whole outfit weighs 11½ lb.

Grinder, Portable, Pneumatic, No. 22-G

Keller Pneumatic Tool Co., Grand Haven, Mich.

"American Machinist," June 9, 1921.

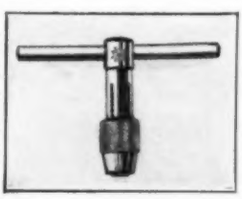


The motor is of the rotary-piston type and is stated to maintain its speed under load. The construction eliminates crankshaft and connecting-rod thrust, and thus any vibration that might be due to these parts. The object of the design has been to develop a tool that will be both handy and well-balanced, it is said, thus lightening the strain on the operator. The tools are built in two sizes, the smaller weighing 5¾ lb. and the larger, 18 pounds.

Wrench, Tap, Adjustable

Consolidated Tool Works, Inc., 296 Broadway, New York

"American Machinist," June 9, 1921.

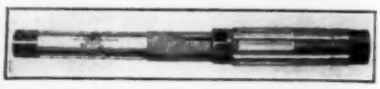


The tool is made from solid bar steel, and is ground and polished to a finish. It is said to be a very handy wrench, being quickly and easily adjusted by means of the threaded collar for holding different sizes of taps, drills, reamers, wire and other articles. The wrench is made in two sizes, the No. 70 tool holding taps up to ¼ in. in size, and the No. 80 up to ½-in. taps.

Reamer, Expansion, Pilot-Blade

New Britain Tool and Mfg. Co., New Britain, Conn.

"American Machinist," June 9, 1921.



The reamer is of the six-blade expansion type with the entering ends of the blades reduced in diameter to serve as a pilot, to keep the reamer straight, and to prevent "digging" and chattering. A complete range of sizes from 15-32 in. to 4 1/16 in. is made. The construction is the same as in the standard expansion reamer manufactured by the company. The tool is intended especially for garages.

Holder, Floating, Reamer and Counterbore

Randa Mfg. Co., 1316 E. Jackson St., Muncie, Ind.

"American Machinist," June 9, 1921.

The device is adaptable for use on automatic screw machines, turret lathes and boring mills, to hold reamer shanks of different sizes, either straight or tapered. The driving is accomplished by means of a square block fitting into correspondingly shaped recesses in both the shank and the floating member. The wearing surfaces are hardened and ground. It is stated that the device is very accurate, the reamer being held parallel to the axis of the spindle and that it can work continuously to close limits. The holder is made in three standard sizes, the No. 1 size holding up to ½ in. reamers, the No. 2 size those ½ to 1½ in. in diameter, and the No. 3 size reamers above 1½ in. The two larger sizes are made so as to provide oil feed for the reamer.

File Grip, Outer, Safety

J. L. Osgood Tool Co., 43 Pearl St., Buffalo, N. Y.

"American Machinist," June 9, 1921.

The grip is intended for use on the outer end of a file the illustration showing it in place. The device is made of rubber, and is pliable and soft, so that it both holds itself in place when slipped on the end of the file, and also prevents cutting and soreness of the hand which occurs from constant pressure on the file teeth. It is stated that the use of the grip enables the holding of the file flat on the work. The grip can be used as a soft-face mallet for light driving on finished surfaces. In case the file be dropped, the cushioning action of the grip prevents breakage of the file or injury to the work on which it may strike. The grip is made for all sizes and shapes of files.

Jig, Drilling, Pin, Automatic

Kingsbury Manufacturing Co., Keene, N. H.

"American Machinist," June 16, 1921.

This pin-drilling jig is for use with the two-spindle automatic sensitive drilling machine made by the concern and described in the "American Machinist" on page 1066, Vol. 53. The jig operates in conjunction with the drilling machine, so that the operation is completely automatic, the illustration showing the jig adapted to drilling the crossholes in small pins, rivets or screws. When the operator pushes the pin to be drilled in place, the spindle is released from its position at the top of its stroke, the pin is automatically locked in place, and the cycle carried through automatically until the spindle rises and the drilled work is unclamped and ejected. When drilling comparatively deep holes, the drill is raised when it is part way through the work.

Clip, paste on 3 x 5-in. cards and file as desired

conditions it is hardly a matter of surprise that the cost of production of most fabricated articles has risen to such a point in Great Britain that great fear is expressed of her ability to retain either her domestic or foreign trade. In many cases the cost of production of British made goods exceeds the selling price of similar German goods in foreign markets and the effort of the government to control the situation by means of reparation duties and "Anti-Dumping" restrictions apparently has not improved a condition due in so large a part to mal-adjustment at home.

In the opinion of many, Germany is by far the most interesting European country to visit at the present time. A people with many ideals different from our own, traits of character which we may not like and internal problems still awaiting solution, may yet teach us much or at least yield us food for reflection. Considering tne difficulties of life, the financial burden, and the internal troubles which Germany is called upon to meet, it is astonishing to see the remarkable progress that is being made. In 1919 there were more than 1,000,000 workers in Germany out of employment but at the present time hardly a quarter of that number are idle. It is said that German industries on an average are working 55 or 60 per cent of full capacity and from personal observation, I know that this degree of activity is even exceeded in certain lines of industry.

Unquestionably in its industrial life Germany is forging ahead and I feel that we need fear German competition more because of the indomitable energy manifested in the country than because of the temporary export advantage which they seem to enjoy through the depression in the value of their currency. Much has been written about the ability of German merchants to undersell us in the American market because of this difference in exchange, but it must not be forgotten that taxes and wages are rising in their country as the purchasing power of the mark falls and consequently the cost of production of fabricated articles expressed in their currency is even from fifteen to twenty-five times greater than before the war—thus neutralizing to a considerable extent the commercial advantage about which we hear so much.

Without dwelling on certain points of difference in our point of view, Germany impressed me as a giant nation temporarily prostrated but vibrant with awakening energy and ambition.

To compete with Germany in staple lines of manufacture will not be an easy thing at best but we cannot too earnestly point out that in attempting to meet this situation we should study to improve methods of production, rather than to depend on tariff protection alone, for permanent relief. The recent report of the Committee on the Elimination of Waste in Industry of the Federated Engineering Societies gives sufficient evidence that we in America have been thoughtlessly wasteful to a degree that imperils our future prosperity. If we do not develop better methods we shall have no one but ourselves to blame if foreign competitors steal our business prestige from us. Particularly in the line of industrial relations is it important that conditions should be stabilized. In 1920 this nation lost through strikes alone a total of over 11,000,000 days of labor. Considering the gigantic task of business defence that confronts us, should not Capital and Labor each undertake its proper and fair part in the readjustment, uniting their forces to help uphold the supremacy of American industry? The present depression and our doubtful future is due to economic causes which cannot be ignored. Entrench ourselves as we may, the fact remains that in industry as in other games of skill, the best man wins. What Capital and Labor in this country need most to take to heart is the naked truth about the foreign situation, so that they may realize we are facing a struggle in which victory and affluence will come only to the nation whose spirit of industry and unselfish co-operation rises supreme over all other considerations.

Business Items

The Runnels-Cummins-Emery Corporation, Milwaukee, Wis., has purchased the Folsom Miller Company's plant at Markesan, Wis. The new owners manufacture electric washing machines, and will continue that work in the new location.

The Westinghouse Electrical and Manufacturing Co. has purchased the plant of the Kilbourne & Clark Manufacturing Co. at Seattle, Wash. The plant will be used as an assembling factory for the Western territory.

The Milwaukee Motor Products, Inc., is the new name assumed by the Milwaukee Auto Engine and Supply Co., of Milwaukee, Wis.

The Arrow Machinery Co. has been organized at Philadelphia, Pa., with salesrooms at 234 N. Third St., where a full line of machine tools and mechanical equipment will be carried. U. A. Heilprin is manager.

The stock, equipment and property of the Globe Metal Products Corporation, Sheboygan, Wis., manufacturer of all metal products, will be sold at public auction soon, to satisfy an execution held by the Citizens State Bank, Sheboygan, Wis.

The Lake Laboratories, Inc., has just been organized at Elkhart, Wis., with George C. Trotter and William H. Burke as incorporators. The new company will manufacture electrical and mechanical devices.

The Pullman Company and the American Car and Foundry Co., at Wilmington, Del., have increased their working force during the past month.

The Liberty branch plant of the Trumbull Steel Co., at Warren, Ohio, has resumed operation in six of its eight mills; about 5,500 men are now employed.

The New Process Gear Plant of the Willys-Overland Co., has contracted to produce the differential gears for the Durant automobiles.

The Associated Motors Industries has taken over the plant and other property of the Jackson Motors Corporation at Detroit, Mich. This new organization is an association of passenger car, truck and accessory manufacturers, combined to meet changed conditions in the industry.

The Gilbert & Barker Manufacturing Co. has opened its latest foundry at West Springfield, Mass. The new building with its equipment is said to have cost approximately $300,000. S. Griffiths is the superintendent.

According to a survey recently completed by George C. Smith, director of the Industrial Bureau of the Board of Trade, Baltimore, Md., there are thirty-four industrial concerns in and near Baltimore which are building new plants or additions to present plants at a total cost of approximately $27,000,000.

With a capital stock of $30,000 the Dixie Tool and Novelty Co. has been organized and incorporated at Charleston, S. C. The following officers are named: V. L. T. Cooper, president; J. H. Roberts, vice-president and general manager; O. J. Muller, secretary and treasurer.

The Bridgeport Motor Truck Co., Inc., Stratford, Conn., has recently moved its plant to Bridgeport, Conn., where it will have more floor space. The company makes the "Bridgeport" motor trucks and was recently incorporated in New Jersey with a capital stock of $1,100,000.

The Kraut, Brenton and Salvucci Co., of Bridgeport, Conn., was recently incorporated to manufacture and deal in reversing devices, turrets, etc. The capital stock of the new company is $20,000. The incorporators are C. F. Kraut, H. J. Brenton and Daniel Salvucci, all of Bridgeport, Conn.

The Hartmann Manufacturing Co., of Hartford, Conn., filed a certificate of incorporation in the State of Connecticut. The company will engage and deal in drill presses, tools, machinery, etc. The capital stock is $25,000, and the incorporators are L. H. Sherwood, R. A. Hartmann and P. W. Porritt, all of Hartford.

The Peerless Die & Tool Co., Cincinnati (Ohio), through its secretary-treasurer. Harry F. Thomas, has admitted the statements of creditors that it is solvent, and is willing to be adjudicated a bankrupt. A majority of the creditors have signified willingness to accept the compromise offered for settlement of their claims and the arrangement is to be given approval in the United States District Court.

The Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y., has recently been appointed the sole American agent for the Hirth minimeter and the Fortuna internal and face-grinding spindles, both of which are manufactured by the Fortuna Werke, Connstatt-Stuttgart, Germany. the concern has also taken over the American agency for A. Leonard & Co., Ltd., London, England, and will sell the renewable single- and double-ended plug gages made by that concern, as well its line of plain and universal V blocks, toolmakers' knees, taper test gages, parallels and box parallels.

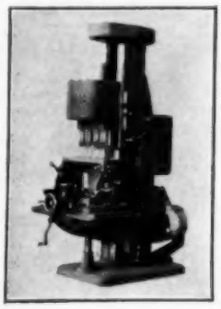
The Cortland Grinding Wheel Corporation has bought from Archie D. Robinson and the Maxf Grinding Wheel Corporation the property of the Hampden Corundum Wheel Co. in Chester, Mass., the purchase price being about $115,000.

United States Hardware and Manufacturing Co., of Pawtucket, R. I., has recently been incorporated to manufacture and deal in hardware, etc. The company was organized under the laws of the State of Rhode Island. The incorporators are John R. White, Providence, R. I., Harry P. Burnham and John D. Sawyer of Pawtucket, R. I.

Condensed-Clipping Index of Equipment

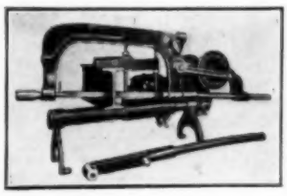
Patented Aug. 20, 1918

Drilling and Tapping Machine, Multiple-spindle, Vertical
Defiance Machine Works, Defiance, O.
"American Machinist," June 16, 1921.



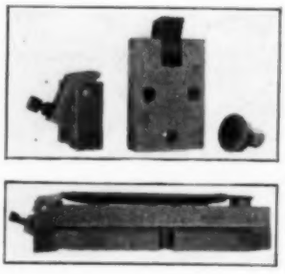
The machine is intended for drilling or tapping a number of holes in a piece simultaneously. The spindles are held in a head with the center distances fixed, so that a different spindle head is required for each part handled. The machine is thus primarily a single-purpose one. The work is held in a quick-clamping fixture, either plain or of the tunnel type, and is usually brought to the machine on a conveyor at the height of the fixture. The head feeds down automatically to the work. All moving parts in the head as well as in the other units are oiled either by splash or spray, it being intended to keep a mist of oil in the compartments surrounding the moving parts. The machine can be driven by belt or by individual motor. If desired, two heads can be operated simultaneously, one above and one below. The machine shown is fitted for drilling, although it can be equipped for tapping.

Saw, Hack, Power, High-Speed, "Economy," No. 400
W. Robertson Machine and Foundry Co., 56 Rano St., Buffalo, N. Y.
"American Machinist, June 16, 1921.



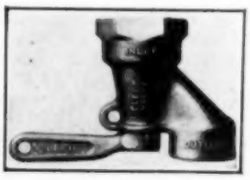
The machine can be used as a general utility saw in the shop when fitted with the two legs as shown. By removing the front leg, it is suitable as a rail saw for use on street railways. The electric current is ordinarily taken from a lamp socket, but where it is not available, the machine may be driven by hand by means of the lever shown lying in front of the saw, after connecting the lever to pins on the crank disk and on the frame. The machine has a maximum capacity of 8 in. and uses 17-in blades. The motor is mounted on a bracket supported on the bed and drives the crank disk through worm gears running in oil. Gravity feed is used, and a lever engaging a stud is provided for holding up the saw while clamping the work.

Dogs, Holding, Fixture
Cincinnati Engineering Tool Co., 4659 Spring Grove Ave., Cincinnati, O.
"American Machinist," June 16, 1921



These special dogs are for use on first-operation fixtures. At the top of the illustration are shown two sizes of the adjustable dogs, with one size of the stationary dog at the right. The lower part of the illustration shows the smaller adjustable dog and the stationary dog in position on a fixture, illustrating their use in holding work. The adjustable dogs with their holders are made of case-hardened machine steel and the stationary dogs are made of hardened alloy steel. It is said that the fixture is easily cleaned, as there are no projecting walls which hold chips. The work can be clamped close to the finished surface.

Valve, Air, Pressure-Seated, "Cleco"
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
"American Machinist," June 16, 1921.



Packing gaskets, stems and springs are eliminated, there being only three parts to the valve, the body, the plug and the handle. The air does not come in contact with the seat of the valve, which prevents damage to the seat and the necessity of replacing it. The air enters at the top of the valve, passing into the top of the hollow plug, and then out of the side of the plug and into the supply line. The turn in the path of the air is slight, so as not to impede the passage. The conical plug is forced in place on its seat by the air pressure itself. The valve is provided with a waste arrangement, to allow the pressure in the air hose on the outlet side to escape when the valve is shut off.

Drilling and Tapping Machine, Multiple-Spindle, Horizontal, Two-Way
Defiance Machine Works, Defiance, O.
"American Machinist," June 16, 1921.

The machine is intended for drilling or tapping simultaneously a number of holes in parts made in large quantities. It is especially adapted to use in conveyor lines employing vertical-spindle machines also, as it is not necessary to turn over the part to drill holes in the sides. The two heads move forward simultaneously. The spindles in the heads have the center distances fixed, so that a different head is required for each different part. The machine is thus primarily a single-purpose tool. The work is held in a quick-clamping fixture, usually of the tunnel type. The machine can be driven by belt or by an individual motor. Splash or spray lubrication is provided for the running parts. A drilling machine is shown, although the machine can be fitted for tapping.

Saw, Hack, Power, High-Speed, "Economy," No. 2
W. Robertson Machine and Foundry Co., 56 Rano St., Buffalo, N. Y.
"American Machinist," June 16, 1921

This is the 1921 model of the No. 2 "Economy" power saw. The machine, which is a draw-cut saw having a capacity of 6 x 6 in., has been equipped with an oil-lift of the type employed on the larger machines made by the concern, and intended for relieving the teeth of the blade from the work on the idle stroke. The oil-lift device consists of a two-cylinder pump submerged in oil contained in the tank shown removed and placed beneath the machine. At the end of the cutting stroke the plunger connected to the crankshaft is on the down stroke, which forces the oil under the plunger connected with the frame, thus raising the saw from the work. It is said that the lift greatly decreases saw breakage. The machine is equipped with a swivel vise for cutting angles up to 45 deg. It is driven through a friction clutch and stops automatically when the cut is completed.

Testing Device, Hardness, Portable
Fritz Werner A.G., Berlin, Germany.
"American Machinist," June 16, 1921.

The portable hardness-testing instrument is operated on the Brinell principle and is not confined in its use to testing rooms, but is intended for workshops and stockrooms and for the small manufacturer. The maker does not claim high accuracy for the device, but that it fulfills all practical requirements. The tool is of simple design, making its handling easy and fool-proof. It can be used for testing stock in place, or set in the machine, not needing special test pieces. When the tool is used, it is held in the hands and the ball end is pressed against the piece to be tested. A piston moves forward, producing an impact of the ball against the piece under test. For ascertaining the hardness of the material, a transparent rule is supplied, showing two lines at a very acute angle and used to measure the size of the ball impression, as shown at the bottom of the figure.

Bulldozer, Vertical
Beatty Machine and Mfg. Co., Hammond, Ind.
"American Machinist," June 23, 1921.

The principal features of the machine are claimed to be the simplicity of construction and the location of the driving parts. The main shaft is mounted through the lower bed instead of overhead, and the main side gears are enclosed in the box-type housing, with all intermediate gears fully enclosed. Clutches and high-speed bearings are easily accessible. Air cylinders are used for counterbalancing the weight of the ram. The bulldozer is especially adapted to work on steel cars. The machine is built in sizes up to and including 500 tons ram pressure. The distance between the housings ranges from 8 to 12 ft. The stroke varies from 18 to 24 in.; and the weight from 12,000 to 24,000 lb.

Clip, paste on 3 x 5-in. cards and file as desired

The New Process Cutlery Co., of New Haven, Conn., has been incorporated under the laws of the State of Connecticut to engage in the manufacture of cutlery, etc. The capital stock is $50,000, and the incorporators are G. F. Hemming, B. W. Hemming and W. H. Hurley, all of New Haven.

Bateman, Inc., which operates the Belcher & Taylor Agricultural Tool Co. works at Chicopee Falls, Mass., along with plants in New York and New Jersey, has filed in the registry of deeds in Springfield, Mass., a mortgage for $700,000 to the Equitable Trust Co., of New York to secure an issue of 8 per cent five-year gold bonds.

The new foundry being constructed by the Clearfield Machine Shop Co. on South Fourth and Spruce Sts., Clearfield, Pa., is nearing completion; the firm is ready to install the equipment. A siding has been built from the Pennsylvania Railroad lines.

The Standard Bolt Corporation, a Delaware corporation, with headquarters in Columbus, Ohio, has taken over the plant and assets of the Standard Bolt Co. The new concern has been organized by the election of Justin C. Burns, president; and Harley E. Burns, vice president and secretary.

The Detroit Seamless Steel Tubes Co., of Detroit, Mich., for over twenty years manufacturer of seamless steel tubing, has found it necessary to increase the sales staff. The position newly created is that of assistant general manager of sales and C. C. Rosser, head of the department, has announced the appointment of C. H. Hobbs for this position. For fourteen years Mr. Hobbs has been with the Lackawanna Steel Co. and for the last five years been the district representative in charge of the Detroit Office.

The Hodes Zinc Manufacturing Co., Fremont, Ohio, manufacturer of fabric accessories for automobiles, has announced the purchase of the factory building of the Shelby Sales Book Co., in that city.

Personals

L. B. THOMPSON, formerly a buyer and salesman for the Simmonds Machine Co., Albany, N. Y., has resigned his position. He is now engaged in private business as a dealer in machinery and equipment.

CLYDE E. DICKEY, Woolworth Bldg., New York, has been appointed sales representative for the metropolitan district for the Peerless Drawn Steel Co., manufacturer of cold-drawn stock, shafting and alloy steels.

W. J. L. BANHAM, of the Otis Elevator Co., has been appointed commander of the manufacturing engineers division in the mobilization of New York business men in the "Budget Guard," under the supervision of Sam A. Lewishon. The movement is for national economy and lower taxes.

ARTHUR L. WALKER, professor of metallurgy in the School of Mines, Columbia University, New York, has been appointed a member of the board of Engineering Foundation. Prof. Walker succeeds Dr. J. W. Richards, of Lehigh University, who died recently.

J. M. DILLON, formerly New England representative of the Detroit Twist Drill Co., Detroit, Mich., is now in charge of the New York territory as district manager. His office is located at 45 Warren St.

SIDNEY M. HENRY, formerly a captain in the U. S. Navy and assistant to Admiral Taylor in the Bureau of Construction and Repair, has become commercial manager of the Emergency Fleet Corporation. His special work is the disposal of the surplus property of the Fleet Corporation.

L. E. COLLINGS, who was with the Gilbert & Barker Manufacturing Co., of West Springfield, Mass., a few years ago, has recently returned as sales representative of that company in the State of Michigan.

J. S. KENNY has recently joined the Los Angeles sales division of the Gilbert & Barker Manufacturing Co., of West Springfield, Mass.

N. A. HODGE has reecntly joined the general sales department of the Gilbert & Barker Manufacturing Co., West Springfield, Mass. Mr. Hodge will be located in the Des Moines, Ia., territory.

F. R. CROSIER, of the general sales department of the Gilbert & Barker Manufacturing Co., of West Springfield, Mass., has recently been transferred from the Los Angeles to the Chicago office of the company.

REUBEN T. COMER has recently joined the sales department of the Whitin Machine Works, Whitinsville, Mass. Mr. Comer was at one time associated with the Lowell Machine Shops and with the Anglo-American Textile Machinery Co.

ANTHONY F. HOLTMEIER, formerly in the sales department of the Hisey Wolf Machine Co., Cincinnati, Ohio, manufacturers of grinding tools, recently has been appointed district sales manager of that concern in the Pittsburg territory.

MORGAN OLCOTT, previously connected with Griggs & Myers, New York, is now with William T. Donnelly, consulting engineer of New York.

WARREN G. C. THOMPSON is assistant professor of mechanical engineering at Pennsylvania State College, having resigned his position as chief engineer for D. G. Dery, Inc., Allentown, Pa.

FRED W. RABE, formerly engineer for Westinghouse Electric and Manufacturing Co., Philadelphia, Pa., is now instructor in the mechanical engineering department of Sheffield Scientific School, Yale University.

H. R. BLAKESLEE has left the employ of C. F. Kenworthy, Inc., of Waterbury, Conn., and entered the engineering department of the Hendry Machine Co., of Torrington, Conn.

HARRY ROSS JONES, for eighteen years president of the United Alloy Steel Corporation, Canton, Ohio, and E. L. Hang, vice-president and secretary of the same concern, have tendered their resignations, effective Dec. 31. Both men will continue to serve on the board of directors, and Mr. Jones will continue to serve on the executive committee of the corporation until the next annual meeting.

CHARLES E. COATS, treasurer, Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y., has recently returned from a four-month trip to England, France and Germany.

Obituary

HARTLEY HOWARD, JR., vice-president and general manager of the Packard Motor Car Co., died suddenly on Nov. 6 at his home near Pittsburgh, Pa.

HENRY S. REGESTER, Sr., aged 69 years, for many years secretary of J. Regester Sons Co., brass founders and bell manufacturers, Baltimore, Md., died on Oct. 31 at the home of his son, Henry S. Regester, Jr., Baltimore. Death was due to paralysis. Mr. Regester was born in Baltimore and when a young man became connected with the business which was established by his father, the late Joshua Regester. When the firm was dissolved about fifteen years ago he became a manufacturers' agent.

JAMES BROWN RIDER, aged 42, vice-president and general manager of the Pressed Steel Car Co., Pittsburgh, Pa., died at his home in that city on Nov. 3. He was ill two months. He began work with the Pressed Steel Car Co. in 1899 as a stenographer to James V. Maher and advanced by steps to the post as general manager.

Trade Catalogs

Francke Flexible Couplings. Smith & Serrel, general agents for the Francke Co., Newark, N. J. Bulletin No. 32, describing a line of flexible couplings and parts, for direct-connected machines. Tables of specifications giving complete data as to use and capacity are included.

Tube Welding Machinery. Davis-Bournonville Co., Jersey City, N. J. Catalog describing a line of welding and fabricating equipment, including slitters, forming machines, straighteners, seam grinders, swagers, cutting-off machines, benders and draw-benches.

Philadelphia Worm Gear Drives. Philadelphia Gear Co., Philadelphia, Pa. Circular describing modern speed-reducing units which feature these worm gear drives.

Ignition, Starting and Lighting Systems. Gilfillan Bros., Inc., Los Angeles, Cal. A catalog giving much valuable information and data for those interested in automotive equipment. The booklet is replete with charts, guides and full specifications for all the products described.

Dexter Chuck. The Levitt Machine Co., Orange, Mass. Circular "C" describing the latest perfected chuck as produced by this company, for use on foot and light power lathes. Lists of sizes and prices are included.

Ingersoll Milling Machines. Ingersoll Milling Machine Co., Rockford, Ill. Bulletin No. 41; a well-prepared and beautifully illustrated catalog, describing the latest drum-type, continuous milling machine. This machine is to mill grey iron castings and steel forgings of any weight or size. Each model is fully specified.

Industrial Furnaces. W. S. Rockwell Co., 50 Church St., New York City. Bulletin No. 234, the fourth of a series illustrating the practical applications of the principles of heat-treating, dealing briefly with the fundamentals that influence the quality and cost of heated products.

Forthcoming Meetings

The annual meeting of the Taylor Society will be held in the Engineering Societies Building, New York City, on Dec. 1, 2 and 3.

The annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, New York City, on Dec. 5 to 9.

A dinner-meeting of the Metropolitan section of the S. A. E. will be held at the Automobile Club, New York City, on Dec. 15.

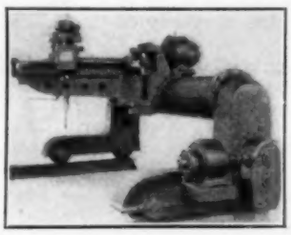
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Drilling Machine, Gantry

William K. Stamets, Jenkins Arcade Bldg., Pittsburgh, Pa.

"American Machinist," June 23, 1921.

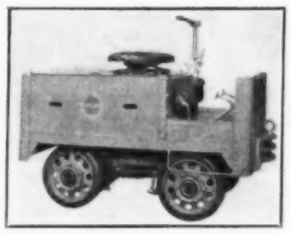


The machine is mounted on a track, the gage of which is broad enough to accommodate the plate to be drilled. The machine is traversed on the track by means of a separate motor. The drilling head is mounted on the radial arm which swings on a support attached to the cylindrical crossbeam. Machines having several heads and arms can be furnished. Arms can be mounted on each side of the cylindrical crossbeams, and more than one head can be mounted if desired. The drive is by an electric motor mounted on the crossbeam. The machine is adapted to the requirements of manufacturers of steel cars, tanks, boilers, or of any product where holes are to be drilled in plants.

Tractor, Industrial, Electric, Four-Wheel-Steer,

Atlas Car and Mfg. Co., 1130 Ivanhoe Rd., Cleveland, Ohio.

"American Machinist," June 23, 1921.



The principal feature of the tractor is the four-wheel-steering apparatus. The tractor can be furnished with either two- or four-wheel drive. It can also be supplied as a four-wheel-drive rail locomotive by substituting flanged steel wheels for the rubber-tired ones and omitting the steering mechanism. The driving axles are of the full-floating type with removable drive shafts. The controller is of the drum type, entirely enclosed, giving three speeds in either direction. The circuit breaker is integral, operated by means of a pedal. A "Powerlock" differential is used. The tractive effort is, under normal conditions, 400 lb. The speed is 6 miles per hour without load. Weight: with Edison battery, 3,700 lb.; with lead battery, 3,950 lb.

Die- and Templet-Making Machine

R. L. Hawkes, 212 Niagara St., St. Catherines, Ontario, Can.

"American Machinist," June 23, 1921.

The machine is intended for the production of dies, punches, templets, and similar tools at a lower cost and in less time than is possible with hand work. It is stated that an unskilled operator can, with a few instructions, make accurate tools, ready to be hardened. To operate, the die blank or templet is roughed out, and then placed in the fixture shown on the table of the machine. Then the guiding finger, which projects downward from the overhanging arm, is set to follow the outline of a design or similar templet on the top of the fixture, the cutting tool, which is a file, following the design and thus shaping the work in the fixture. Various shapes of files can be used, according to the profile of the work.

Bending Machine, Pipe

Leonard Machine Works, 1023-27 Race St., Philadelphia, Pa.

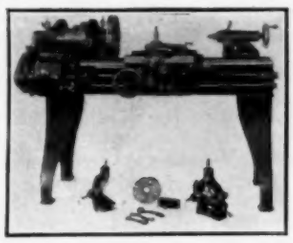
"American Machinist," June 23, 1921.

This machine is made in three sizes, No. 1, which bends pipe from 0 to ¼ in., No. 2 from 1 to 2 in., and the No. 3 from 2 to 4 in. The No. 1 machine, which is shown, can be furnished with or without a floor pedestal, while the Nos. 2 and 3 sizes are furnished with the floor pedestal as regular equipment. Each machine is equipped with four forming heads and four bending shoes, and special shoes can be furnished for handling unusual work. To operate, the pipe is slipped through the guard that protrudes from the forming head, and then the small pinion is rotated until the shoe is in contact with the pipe. As the hand lever is swung around, the pipe is bent at the forming head. The machine with forms for 1, ¾, ½ and ¾-in. pipe weighs 115 lb., and with a stand, 225 lb.

Lathe, Quick-Change, 12-Inch, "Economy"

Rockford Lathe and Drill Co., Rockford, Ill.

"American Machinist," June 23, 1921.

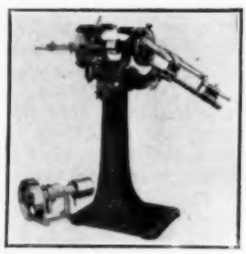


A four-step cone pulley is provided for the drive, and is connected with back gears of a ratio of 8.06 to 1. The spindle has a 1 1/16 in. hole through it, permitting the use of draw-in collets up to ⅞ in. capacity. The tailstock is offset to allow the compound slide to set parallel with the bed, and it is provided with a set-over for turning tapers. The carriage is provided with a thread indicator which can be disengaged when not in use. All feeds are reversed in the apron, and their controls interlock with the bronze lead-screw nut. A redesigned quick-change gear box provides thirty-two changes of feed, obtained through sliding steel gears and hardened steel clutches. The lead-screw rotates only when in use for thread cutting. Net weight, with 5-ft. bed, 1,300 lb.

Grinding Machine, Tap and Drill, Combination

Grand Rapids Grinding Machine Co., Grand Rapids, Mich.

"American Machinist," June 23, 1921.

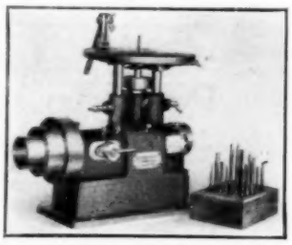


The machine is designed for shops having need for correctly ground drills and taps, and is said to combine all the advantages of single-purpose machines. The machine automatically grinds the same taper and clearance on every flute of a tap. The drill-grinding side of the machine is equipped with a holder stop, which, working in connection with the base of the diamond truing device, automatically places the drill holder in proper relation to the face of the grinding wheel. With the No. 10-A and 10-B machines, two types of wheel-truing devices are furnished, one for truing the periphery of the tap grinding wheel, the other for truing the face of the drill grinding wheel. Diamonds of approximately one-half carat are furnished for each wheel. The machine is made in two sizes, having net weights of 385 and 400 lb., respectively.

Filing Machine, Bench, Universal

Boston Tool & Mfg. Co., 262 Dover St., Boston, Mass.

"American Machinist," June 23, 1921.



This bench filing machine has both a reciprocating movement for using ordinary files and a rotary motion for round files or special milling cutters. The table can be tilted to any desired angle for the purpose of giving the requisite draft to the dies. An arm is bolted to the table, so as to furnish a rigid support to the upper end of the file. The reciprocating files are made parallel, so that the angle of clearance on the work is determined wholly by the angular setting of the table. The rotary files are tapered to suit the angle of clearance, the table being set square with the axis of the spindle. The machine occupies a bench space of about 9 x 12 in. and stands 11 in. high. The chuck is adapted to hold file shanks ¼ in. in diameter. The circular table is 7 in. in diameter and the stroke is sufficient to finish dies 1¾ in. in thickness.

Gage, Depth, Micrometer, B & S

Brown & Sharpe Mfg. Co., Providence, R. I.

"American Machinist," June 23, 1921.

The latest micrometer depth gage made by the concern is obtainable with either a 2½ or 4 in. base. It is furnished complete with three measuring rods which enable readings from 0 to 3 in. to be taken by thousandths of an inch, the micrometer screw having a movement of 1 inch. The selected rod can be placed in position by removing the cap, which when replaced brings the nut on the rod against the seat. Using the nut as a shoulder permits individual adjustment of the rod. Adjustment is provided for wear of the threads on the micrometer screw.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED

Machine Tools and Machinery Wanted

Machine-tool wants published without charge

N. H., Berlin—The Berlin High School, D. W. MacLean, Headmaster—$25,000 worth machine shop equipment for new high school shops.

N. Y., New York—The Erie R. R., 50 Church St., Mechanical Dept.—sxity-four items machine tools and machinery for various shops. We have wired for confirmation but no reply received.

N. Y., New York—The Miller Brass Fitting Co., 33 Bleeker St.—No. 22 or 23 New Britain automatic chucking machine, (used).

Pa., Philadelphia—Arnold & Co., 1019 Cherry St., M. E. Arnold, Purch. Agt.—one 12 in. machine lathe, 5 ft. bed, and one 20 in. hand or power feed drill press.

Pa., Pittsburgh—The West Penn Power Co., West Penn Power Bldg.—three 28-in. drill presses, 3 grinders, three 24-in. shapers, 3 hack saws, 2 pipe machines, 2 hammers, one 24-in. drill, one 18-in. lathe and one 3-ft. radial drill.

Ala., Anniston—The National Forge Co.—
One lathe, 20 in. x 10 ft. bed.
Two motor driven blowers.
One 1 in. automatic upsetting or forging machine.

Ala., Birmingham—G. R. Mueller Co., Brown-Marx Bldg., G. R. Mueller, Purch. Agt.—
One 1¼ in. capacity bolt threading machine, belt or motor driven.
One bevel shear, Lennox preferred, ½ in. to ¾ in. steel plate, capacity, belt or motor driven.
One 3 ton capacity electric hoist, standard lift, 220 volt, 3 phase, 60 cycle current available, or one 3 ton capacity air hoist. (used if in good condition).

La., New Orleans—The Commercial Garage, and Auto Service Specialists, 915-23 Conti St.,—double end grinder, drill press and lathe (new or used.)

La., New Orleans—J. S. Grego, 3435 Dryades St., auto equipment, adjusting and socket wrenches, medium size reamers, etc.

La., New Orleans—The Orleans Steel Products Co., Inc., 1021-25 Bienville St., W. Holzer, Mgr.—One cylinder grinding machine for grinding automobile cylinder block.
One G. A. Ohl, ½ in. capacity power cornice press brake.
One 36 in. Niagara power gang slinging machine.
One 10 ft. G. A. Ohl or equal, power squaring or gap shear to cut ⅛ material. (used).

La., New Orleans—Rabito, Lind & Kraft, 1818 Carondelet St., (auto repair shop)—small Dalton lathe, (used), also automobile wrecking outfit.

La., New Orleans—Toulouse Auto Repair Shop, 825 Toulouse St.—small lathe, Dalton or equal, also drill press, auto jack and auto equipment.

W. Va., Charleston—The Nitro Mfg. Mine Supply Co., P. O. Box 1494, P. J. Rowan, Purch. Agt.—machinery and equipment for proposed machine shop and foundry.

Ill., Aurora—The Walker Laundry Co.—one 8 to 10 ft. lathe.

Ill., Chicago—The Amer. Metal Co., 2801 South Kedzie Ave.—one square shear, 136 in.

Ill., Chicago—The N. S. Ball Bearing Co., 4538 Palmer St., S. R. Schubert, Purch. Agt.—one bar shear and 5-in. roll bar.

Ill., Chicago—F. W. Mateer & Co., 230 West Ontario St., manufacturer of laundry equipment—one 8 in. jointer.

Ill., Chicago—The Reliance Iron & Steel Co., 2141 South Sawyer Ave.—power shear to cut up scrap.

Ind., Muncie—The Warner Corp., Clerk and Penn Sts., J. F. Warner, Purch. Agt.—two No. 12 Barber-Colman gear hobbing machines and one No. 13 Watco Multi drill with rectangular head, (used).

Mich., Detroit—The Dept. of Purchases and Supplies, 710 Marquette Bldg., G. J. Finn. Purch. Agt. one pipe and bolt threading machine also one set extra pipe dies.

Mich., Detroit—The Federal Motor Truck Co., 5780 Federal St., H. E. Snyder, Gen'l Supt.—forming or upsetting machine.

Mich., Homer—W. E. Dryer & Sons, 601 South Sophia St., E. W. Dryer, Mgr.—
One 36 in. lathe, 12 ft. bed.
One 18 in. lathe, 10 ft. bed.
One 24 in. or 30 in. shaper.
One 3 ft. or 4 ft. radial drill.
Set of high speed drills, size from ½ in. to 2 in., drills must be 32nds. over size.
One 12 x 14 hack saw or larger, also 24 saw blades to fit same.
One 36 in. band saw tilting table, also one extra saw.
One wood lathe, 36 in. capt.
One ¾ x ¾ in. power punch and shears combined.
One Emery arbor with 16 in. wheels.
One threading machine for bolts size ¼ to 2 in. with taps and dies.
Two vices, one 8 in. Black Smith and one 8 in. Bench.
One air hammer.
One 40 ft. line shaft, pulley, hangers, belts, line shaft speed 200 R.P.M.

O., Cleveland—The Manual Training School, 2122 Prospect Ave.—No. 2 or 3 punch press (used).

O., Cleveland—The Perfection Auto Parts Co., 400 Lakeside Ave.—machine for maching connecting rods.

Wis., Cedar Grove—Lemke & Hesselink Co., H. Lemke, Purch. Agt.—equipment for auto repairing including lathe, 1 ton press, etc.

Wis., Fond-du-lac—B. F. Sheridan, Route 6—drill press and air compressor for auto repairs.

Wis., Kenosha—The Winther Motor Co., North Shore Rd., W. F. Swift, Purch. Agt.—machine tools and power machinery for proposed factory.

Wis., Madison—J. W. Pepper, 310 East Wilson St.—machinery for plumbing and millworking shops.

Wis., Manitowoc—K. O. Muehlberg Co., 209 North 9th St.—special machinery for proposed machine shop on 9th St.

Wis., Milwaukee—The Badger Beet Topper Co., 963 Mitchell St. manufacturer sugar beet topping machines. S. F. Parker, Purch. Agt.—lathe and drill press.

Wis., Milwaukee—Jack's Garage, 691 Mitchell St.—one lathe for auto repair shop.

Wis., Sheldon—L. A. Cox—equipment and machinery for auto repairing.

Wis., Milwaukee—J. Madis, 1184 24th St.—sheet metal manufacturer—square shears and brake.

Wis., Milwaukee—K. O. Muehlberg Co., 209 North 9th St.—tool room lathe.

Wis., Milwaukee—The Pauly Garage, 24th St. and 9th Ave. L. C. Pauly, Purch. Agt.—lathe suitable for auto repair duty.

Wis., Milwaukee—A. Schier, 728 Pearl St.—additional sheet metal working machinery.

Wis., Wauwatosa—G. Hummel, 2500 North Ave.—one machine lathe for auto repairs.

Mo., Lamar—The Osage Power Site Co., W. E. Banks, Mgr.—machinery for machine shop and power plant.

Ont., Windsor—Colonial Motors, Ltd., Exchange Bldg., J. O'Brien, Purch, Agt.—lathes, drills, presses and general equipment for the manufacture of autos.

Que., Montreal—C. Laplerre, 1611 Cadieux St.—full equipment for auto repair shop.

N. Y., Rochester—The Syracuse Supply Co., 306 Arlington Bldg., manufacturers of oak tanned leather belting, D. R. Clarkson, Mgr.—machine for straightening and taking kinks out of tubing from 2 to 4 in. in diameter and up to 25 ft. long, also a 36 in. squaring shear to take metal up to No. 14 gage.

Pa., Norristown—The Norristown Hosiery Mills—knitting machines for proposed mill in Lansdale.

Pa., Pittsburgh—The Standard Underground Cable Co., 15th St.—2 cranes one 5-ton, other 10-ton, floor operated, for new plant in Pittsburgh, also 2 cranes, one 5-ton and other 15-ton for St. Louis plant.

Fla., Daytona—C. M. Randall, 40 Orange St.—stump pullers, portable saw mills, cutting-off saws, wood splitters, tractors, heavy service plows, etc.

Ga., Savannah—W. J. Walker, Hicks Hotel—machinery and other equipment to manufacture cane syrup.

La., New Orleans—W. Ball, Purch. Agt., City Hall, is receiving bids for the installation of a 21 ton refrigerator plant to be installed in the Poydras St. Market.

S. C., Florence—The Hotel Florence, J. W. Heaps, Purch. Agt.—complete machinery for laundry.

W. Va., Clarksburg—The Imperial Ice Cream Co.—refrigerator machinery and equipment for ice cream plants, following capacities and locations, 100 ton at Huntington; 40 ton, Ashland, Ky.; 40 ton, Steubenville, O.; 40 ton, Staunton, Va.; 30 ton, Winchester, Va., and 30 ton, Harrisonburg, Va.

W. Va., Huntington—The H. T. Lambert Co., 1018 1st Natl. Bank Bldg.—manufacturers of railway equipment—15-ton overhead crane.

W. Va., Romney—Tas-Te Fruit & Canning Co., Inc., of Romney and 191 Market St., Paterson, N. J., P. O. Box 1454, P. R. Fredricks, Pres.—box and crate making machinery. Apple parers and corers also peach and cherry pitters. Six cast aluminum tanks, inside dimensions, 7 x 3 ft. and 1 ft. deep, walls ½ or ¾ in. thick, reinforced top edge, rounded inside corners, no sharp creases or seams, reinforced bottom with ribs at least 1 in. high, running lengthwise on bottom of tanks, 9 in. apart, 4 in all. Heating apparatus for use with tanks, underneath, burning either oil or gasoline. Will consider electric equipment. Must be capable of bringing cold water up to boiling point and hold it at that point for one hour or more.

The Weekly Price Guide

This Week's Market

Pittsburgh mills continue to quote structural steel shapes, plates and bars at $1.50@$1.65 per 100 lb. Bars are easily obtainable at $1.50; but $1.60 constitutes the minimum on shapes and plates, with small tonnages selling at $1.65. Mill shipments, New York, continue at $1.88@$2.03; bars at $1.80@$1.88 per 100 lb. Steel warehouse prices remain firm in New York and Cleveland. Chicago quotes hoop steel at $3.28 as against $3.48 per 100 lb.; also general decreases in shop supplies and a slight advance in old metals.

Cleveland quotes solder at 21c. as compared with 23½c. per lb., formerly.

Linseed oil declines 3c. in Cleveland and advances 2c. per gal. in Chicago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$24.50
Northern Basic	22.52
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	30.26
BIRMINGHAM	
No. 2 Foundry	20.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.75
Virginia No. 2	28.74
Basic	20.75
Grey Forge	21.75
CHICAGO	
No. 2 Foundry local	22.70
No. 2 Foundry, Southern, sil 2.25@2.75	26.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.96
Basic	21.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50	3.53	3.10	3.38
No. 12	2.55	3.58	3.15	3.43
No. 14	2.60	3.63	3.20	3.48
No. 16	2.80	3.73	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	68½	56	¾ to 1½	44½	29½
LAP WELD					
2	61½	49	2	39½	25½
2½ to 6	65½	53	2½ to 4	42½	29½
7 to 8	62½	49	4½ to 6	42½	29½
9 to 12	62½	49	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	66½	55	1 to 1½	44½	30½
2 to 3	68½	56			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	59½	48	2	40½	27½
2½ to 4	63½	52	2½ to 4	43½	31½
4½ to 6	62½	51	4½ to 6	42½	30½
7 to 8	58½	45	7 to 8	35½	23½
9 to 12	52½	39	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	46%	60½%	47½%	60%	46%
3½ to 6 in. steel lap welded	51%	37%	58½%	44½%	57%	43%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	*3.78
Spring steel (light) (base)	6.00	6.00	*2.93
Coppered Bessemer rods (base)	8.00	8.00	*6.03
Hoop steel	3.88	3.29	3.28
Cold rolled strip steel	7.50	8.25	6.75
Floor plates	4.85	....	5.23
Cold finished shafting or screw	3.88	3.50	3.83
Cold finished flats, squares	4.38	4.00	4.35
Structural shapes (base)	2.88	2.74	2.88
Soft steel bars (base)	2.78	2.64	2.78
Soft steel bar shapes (base)	2.78	2.64	2.78
Soft steel bands (base)	3.43	....	3.48
Tank plates (base)	2.88	2.92½	2.88
Bar iron (2.15@2.25 at mill)	2.78	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
5/32	8.50		12@13
1/8	7.15		11@12
5/32 to ¼	6.75		10@11

* Price to Dealers.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	28.50
Lead (up to carlots), St. Louis, 4.60; New York	5.00
Zinc (up to carlots), St. Louis, 4.97½; New York	5.37½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.00	20.00	20.00
Antimony (Chinese), ton spot	5.50	6.50	6.00
Copper sheets, base	20.75	21.50	22.50
Copper wire (carlots)	16.50	16.50	15.75
Copper bars (ton lots)	19.00	23.00	19.00
Copper tubing (100-lb. lots)	20.50	23.00	22.50
Brass sheets (100-lb. lots)	16.25	17.00	18.25
Brass tubing (100-lb. lots)	18.00	19.00	20.00
Brass rods (1,000-lb. lots)	14.25	16.00	15.25
Zinc sheets (casks), (8% dis. carlots)	11.00	11.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.50	21.00	18.00
Babbitt metal (best grade)	70.00	39.00	34.00
Babbitt metal (commercial)	30.00	13.50	8.00

—Shop Materials and Supplies

MONEL METAL—Base price in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.50	9.50
Copper, light, and bottoms	8.00	8.00	8.25
Lead, heavy	4.00	3.75	3.75
Lead, tea	3.00	2.75	3.00
Brass, heavy	6.50	6.00	8.00
Brass, light	5.00	4.00	5.50
No. 1 yellow brass turnings	5.25	4.50	5.25
Zinc	3.00	2.00	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	21.50	.....	.....
IX, 20x28, 112 sheets	24.00	.....	.....
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	18.50	.....	.....
IX, 20x28, 112 sheets	21.50	.....	.....
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	14.00	13.00	14.50
IC, 112 sheets	14.30	13.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.50	6.25	7.25
IC, 14x20	7.75	6.50	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.10
Wiping cloths per M., 13¼x13¼	.....	55.00	55.00
Wiping cloths per M., 13¼x20½	.....	65.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.72	.77	.74
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per ton	$3.25@3.35	
Coke, prompt foundry, Connellsville	per ton	4.25@4.75	

SHOP SUPPLIES

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	—50%	—60%	60-10-10%
1¼ and 1¼x3 in. up to 12 in.	—40%	-60-10-10%	-60-10%
With cold punched sq. nuts	—30%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	—40%	.....	$4.00 off
Button head bolts, with hex. nuts	—20%	$3.90 net	.....
Hex. head and hex. nut bolts	—20%	.....	-65-5%
Lag screws, coach screws	—50-10%	.....	—60%
Carriage bolts, all sizes up to 1 in. x 30 in.	—45%	—50-10-10%	50-5%
Bolt ends, with hot pressed nuts	—50%	.....	—55%
Tap bolts, hex. heads	—20%	.....	.....
Semi-finished nuts all sizes	—70%	—75%	—80%
Case-hardened nuts	—60%	.....	.....
Washers, cast iron, ½ in., per 100 lb. Off list	$5.00	$5.50	$3.50 net
Washers, cast iron, ⅜ in. per 100 lb. Off list	4.25	3.75	3.50 net
Washers, round plate, per 100 lb. Off list	3.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	3.00	4.00
Rivets:			
Rivets, $\frac{7}{16}$ in. dia. and smaller	-50-10%	60-10-10%	-65-5%
Rivets, tinned	-50-10%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.70	3.50	3.43
Cone heads, ditto (net)	3.80	3.60	3.53
1⅛ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅞ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	—50-10%	—40-10%	—50-10%
Copper burs	—25-10%	—15%	—10%
Lard oil, pure, (50 gal. bbl.) per gal.	0.95	.....	.....
Lard cutting oil (50 gal. bbl.) per gal.	0.60	.....	.....
Machine oil, lubricating, per gal.	0.40	.....	.....
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50-5%	.....	50-5%
Medium grade	45%	.....	.....
Heavy grade	40%	.....	.....
Rubber and duck:			
First grade	50-10%	.....	.....
Second grade	60-5%	.....	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$9.00 less 20-10-5%		....-20-10%
Emery paper	11.00 less 20%	.....	-20%
Emery cloth	32.75 less 10%	.....	-10%
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	$4.50 net	.....	list+10%
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	$1.65 less 20%	.....	-10%
Cloth	$3.55 less 10%	.....	-10%

O., Cleveland—The Zerk Lubricator Co. has taken over the plant of the Ri-Chard Automobile Co. at 7800 Finney Ave.—additional equipment.

O., Salem—The Church-Budget Envelope Co.—several small lathes, 24 in. between centers, 12 in. swing (used).

O., Winton Place (Cincinnati P. O.)—The Cincinnati Car Co., J. H. Elliott, Wks. Mgr.—one 2 stage, motor driven, 400 ft. air compressor, (used).

Wis., Appleton—The Standard Mfg. Co., 934 Lawe St.—millers, planers and other woodworking machinery also steam power machinery for saw mill.

Wis., Cedarburg—J. J. Wittenberg—two shaping machines, etc., for proposed tire factory on Main St.

Wis., Milwaukee—C. Kronis, 860 Teutonia Ave.—band saw for cabinet maker.

Wis., Eden—The Nast Bottling Co., W. J. Nast, Purch. Agt.—motor or belt driven filling machine, sealing machine, washers, and carbonator.

Wis., Milwaukee—The Caldick Furniture Co., 136 3rd St., C. Luhrsen, Purch. Agt.—one planer.

Wis., Milwaukee—The Milwaukee Electrical Wks., 315 Mineral St.—one complete welding outfit.

Wis., Milwaukee—Milwaukee Washing Machine Co., 3928 Vliet St., W. Erni, Pres.—wood working machinery and special machinery for Clinton factory.

Wis., Milwaukee—The Reliable Photo Service Co., 907 3rd St., A. Grosswitz, Purch. Agt.—one power paper cutting machine.

Wis., Milwaukee—J. Wilging & Co., 1612 Teutonia Ave., J. Wilgin, Purch. Agt.—one 12 or 16 in. jointer and a 7 in. sticker for mill work.

Wis., Milwaukee—J. Zapf, 1341 40th St. (woodworker)—one 6-in. sticker.

Wis., Monroe—J. Gempeler—ice cream making machinery with electric motor, also refrigerating equipment.

Wis., New Lisbon—Genl. Device Corp., F. W. Bolzendahl, Purch. Agt.—rubber working machinery for the manufacture of rubber specialties.

Wis., Beaver Dam—R. Christian—air compressor, gasoline tank and pumps.

Mo., Cape Girardeau—C. Wielpuetz Bakery Co.—machinery for proposed bakery at Poplar Bluff.

Mo., Jefferson City—The Central Missouri Coal & Mining Co., Suite 314 Central Trust Bldg., J. McManus, Secy.-Treas.—coal mining machinery and equipment.

Ont., Milverton—J. Boshart—machinery and equipment for the manufacture of heavy shoes.

Que., Montreal—I. Paquin, 962 Dorion St.—embossing machine capable of printing on brass plate, dimensions from 3 in. sq. to 2 ft. sq., the letters to be from ¼ in. to 3 in.

Metal Working Shops

NEW ENGLAND STATES

Mass., Charlestown—D. J. Kane, 73 Tremont St., Boston, has awarded the contract for the construction of a 1 story, 115 x 120 ft. garage on Warren St. Estimated cost, $50,000.

Mass., Dorchester—W. Baker & Co., Ltd., Pierce Sq., has awarded the contract for the construction of a 3 story, 40 x 100 ft. storehouse and garage. Estimated cost, $50,000.

Mass., Rutland—Treasury Dept., J. A. Wetmore, Supervising Archt., Washington, D. C., will receive bids until Nov. 22 for the construction of various buildings including a 1 stcry, 36 x 91 ft. laundry and garage. Total cost, $500,000.

Mass., Springfield—The Readio Co., 62 Yale St., has awarded the contract for the construction of a 1 story, 54 x 130 ft. auto repair shop on Magazine St. E. C. Spear, Pres. Private plans.

MIDDLE ATLANTIC STATES

N. J., Mt. Holly—W. A. Jones, Washington and King Sts., has awarded the contract for the construction of a 1 story, 100 x 200 ft. garage and service station. Estimated cost, $60,000. Noted Oct. 6.

N. Y., Kellogg (Buffalo P. O.)—The Electro Refractory Co., Ellicott Sq. Bldg., Buffalo, plans to construct a 50 x 300 ft. factory and a 30 x 75 ft. machine shop, on Town Line Rd. Estimated cost, $100,000.

Pa., Mifflinburg—The Mifflin Auto Body Co. is having plans prepared and soon receives bids for the construction of a 2 story, 40 x 100 ft. factory. Estimated cost, $45,000. R. R. Markley, Spooner Bldg., Harrisburg, Archt.

Pa., Philadelphia—The Union Transfer Co., 1004 Spring Garden St., has had plans prepared for the construction of a 1 story, 150 x 165 ft. garage. Estimated cost $40,000. C. T. Mitchell, 129 South 5th St., archt.

SOUTHERN STATES

Ky., Louisville—Gray-Von Allmen Milk Co., 1143-45 Garvin Pl., is receiving bids for the construction of a 2 story, 93 x 122 ft. garage on 5th and Oak Sts. Estimated cost, $60,000. F. Erhart, Norton Bldg., Archt.

W. Va., Brocious—The Hancock Steel Co., Hancock, Md., is receiving bids for the construction of the 1st unit of its plant, here, a 1 story, 130 x 200 ft. machine shop and foundry. Total cost, $3,500,000. E. McGeorge, 1900 Euclid Bldg., Cleveland, O., Archt.

MIDDLE WEST STATES

Ill., Chicago—The Austin Machinery Co., 865-79 Sangamon St., is having plans prepared for the construction of a 4 story, 80 x 160 ft. factory on North Sangamon St. Estimated cost, $80,000. Fox & Fox, 38 South Dearborn St., Archts.

Ill., Chicago—The Newberry Library, c/o Mundie & Jensen, Archts., 39 South La Salle St., is having plans prepared and soon receives bids for the construction of a 1 story, 75 x 100 ft. garage at 215-19 West Erie St. Estimated cost, $40,000.

O., Cleveland—The Assn. for Crippled and Disabled, 2233 East 55th St., has awarded the contract for the construction of a 2 story, 40 x 80 ft. brace factory and garage. Estimated cost, $40,000.

O., Cleveland—T. B. Foley, 5716 Franklin Ave., is having plans prepared for the construction of a 1 story, 69 x 80 ft. garage at 1445 West 58th St. Estimated cost, $40,000. Private plans.

O., Cleveland—Greenwald, Stecker & Wallach, 535 Society for Savings Bldg., are receiving bids for the construction of a 2 story, 67 x 268 ft. garage and commercial building, at 1934 East 105th St. Estimated cost, $60,000. N. Petti, 1526 Williamson Bldg., Archt.

O., Cleveland—J. M. Sands, Sweeney Ave., manufacturer of water heaters, has awarded the contract for the construction of a 1 story, 37 x 100 ft. forge shop at 10300 Harvard Ave. Estimated cost, $40,000. Noted Nov. 3.

O., Cleveland—The Speck Baking Co., 3310 Central Ave., has awarded the contract for the construction of a 2 story, 40 x 80 ft. garage at 3330 Central Ave. Estimated cost, $40,000.

O., Cleveland—The Stone Improvement Co., Kirby Bldg., is having plans prepared for the construction of a 1 story, 100 x 150 ft. garage and commercial building, on East 83rd St., and Carnegie Ave. Estimated cost, $75,000. P. Matzinger & Co., Caxton Bldg., Archts.

O., Cleveland Heights (Warrensville P. O.)—H. Wagner Garage, 1162 Addison Rd., Cleveland, has had plans prepared for the construction of a 1 story, 51 x 84 ft. garage at 1817 Coventry Road here. Estimated cost, $40,000. Private plans.

O., Columbus—The Carroll Chain Co., 63 Smith Pl., is having plans prepared for the construction of a 1 story, 50 x 150 ft. factory on South High St. Estimated cost, $25,000. D. Carroll, 63 Smith Pl., Archt.

Wis., Beaver Dam—R. Christian plans to build a 1 story, 60 x 120 ft. garage. Estimated cost, $40,000. Architect not selected.

Wis., Clinton—The Milwaukee Washing Machine Co., 155 West Water St., Milwaukee, plans to build a 1 story, 40 x 180 ft. factory. Estimated cost, $50,000. Private plans.

Wis., Hingham—P. Ernissee & Co. has awarded the contract for the construction of a 2 story, 50 x 95 ft. garage and machine shop. Estimated cost, $45,000. Noted Nov. 3.

Wis., Hurley—L. Santini is having plans prepared for the construction of a 1 story, 50 x 95 ft. garage and machine shop on Main St. Estimated cost, $42,000. Private plans.

Wis., Kenosha—The Winther Motor Co., North Shore Rd., has awarded the contract for the construction of a 1 story, 61 x 386 ft. factory. Estimated cost, $250,000.

Wis., LaCrosse—The Nat'l Refining Co., 7th and Wall Sts., Dubuque, Ia., is receiving bids for the construction of a 1 story, 40 x 100 ft. warehouse and 40 x 50 ft. garage on 12th St., here. Estimated cost, $40,000. Private plans.

Wis., Manitowoc—K. O. Muehlberg Co., 209 North 9th St., has purchased a site and plans to build a 1 story, 60 x 125 ft. machine shop on 9th St. Estimated cost, $55,000. Architect not selected.

Wis., New Lisbon—The General Device Corp., F. W. Bolzendohl, Pres., plans to construct a 1½ story, 50 x 120 ft. factory on Main St. Estimated cost, $85,000. Architect not selected.

Wis., West Allis—The Kroening Constr. Co., 68th and Greenfield Aves., will build a warehouse and garage on 39th Ave. Estimated cost, $40,000.

WEST OF THE MISSISSIPPI

Kan., Wichita—F. L. Wright, 310 Schweiter Bldg., will build a 1 story, 75 x 130 ft. garage at 137-41 North Water St. Estimated cost, $40,000.

Minn., Duluth—The Duluth Auto Exchange Co., J. A. Kohn, Mgr., 201 East 1st St., has awarded the contract for the construction of a 2 story, 100 x 140 ft. garage on East 1st St. Estimated cost, $60,000. Noted Aug. 11.

Mo., St. Louis—Hall & Brown Woodworking Machine Co., 1913 North Bway., will soon award the contract for the construction of a 2 story factory at 1900 North Bway. Estimated cost, $50,000. P. J. Bradshaw, International Life Bldg., Archt.

Mo., St. Louis—C. Lischer, 4247a Grace Ave., will build a 1 story, 75 x 125 ft. garage. Estimated cost, $45,000.

Mo., St. Louis—The Missouri Pacific R. R. Ry. Exch. Bldg., will soon award the contract for the construction of a 1 story, 46 x 500 ft. car repair shop. Estimated cost, $125,000. E. A. Hadley, Ry. Exch. Bldg., Archt.

CANADA

Ont., Windsor—The Colonial Motors, Ltd., L. A. McCalla Genl. Mgr., Exchange Bldg., plans to remodel factory for the manufacture of automobiles.

General Manufacturing

NEW ENGLAND STATES

Mass., Haverhill—C. M. Kelley will soon award the contract for the construction of a 7 story shoe factory on Water, School and Chestnut Sts. Estimated cost, $500,000. Private plans.

MIDDLE ATLANTIC STATES

D. C., Washington—Wise Bros., 3206 N. St., N. W., will soon award the contract for the construction of a dairy building. Estimated cost, $75,000. A. P. Clark, Jr., 816 14th St., Archt.

Md., Baltimore—The Maryland State Dairymens Assn., Inc., Fidelity Bldg., has awarded the contract for the construction of a 2 story, 32 x 58 x 68 ft. plant at 1421-25 Aisquith St., for the manufacture of various products from surplus milk products. Estimated cost, $20,000.

N. Y., Brooklyn—The Graselli Chemical Co., 347 Madison Ave., New York City, has awarded the contract for the construction of an addition, consisting of 4 buildings, to its chemical plant along Newtown Creek here. Estimated cost, $100,000.

N. Y., Syracuse—Gaylord Bros., 506 South Clinton St., have awarded the contract for the construction of a 3 story, 65 x 100 ft. factory on Gifford and Granger Sts. for the manufacture of paper supplies. Estimated cost, $60,000. M. L. King, Snow Bldg. Archt.

Pa., Berlin—The Eclipse Wood Pulley Co. plans to rebuild its plant which was recently destroyed by fire. Estimated loss, $50,000. G. T. Brubaker, Pres.

Pa., Dorranceton—(Kingston P. O.)—M. F. Fadden has awarded the contract for the construction of a 2 story 58 x 91 ft. ice cream plant. Estimated cost, $90,000. Noted Nov. 10.

Pa., Lansdale—The Norristown Hosiery Mills, Norristown, has awarded the contract for the construction of a 2 story, 48 x 162 ft. factory. Estimated cost, $50,000.

Pa., Philadelphia—J. M. Kennedy, 406 South Van Pelt St., has awarded the contract for the construction of a hosiery factory on B. and Allegheny Aves. Estimated cost, $33,600.

Pa., Philadelphia—L. J. Priestley, Jr., 1312 Sansom St., is havnig preliminary plans prepared for the construction of a 3 story printing factory on 5th and Butler St. Estimated cost, $75,000. H. Reinhold, 1513 Walnut St., Archt.